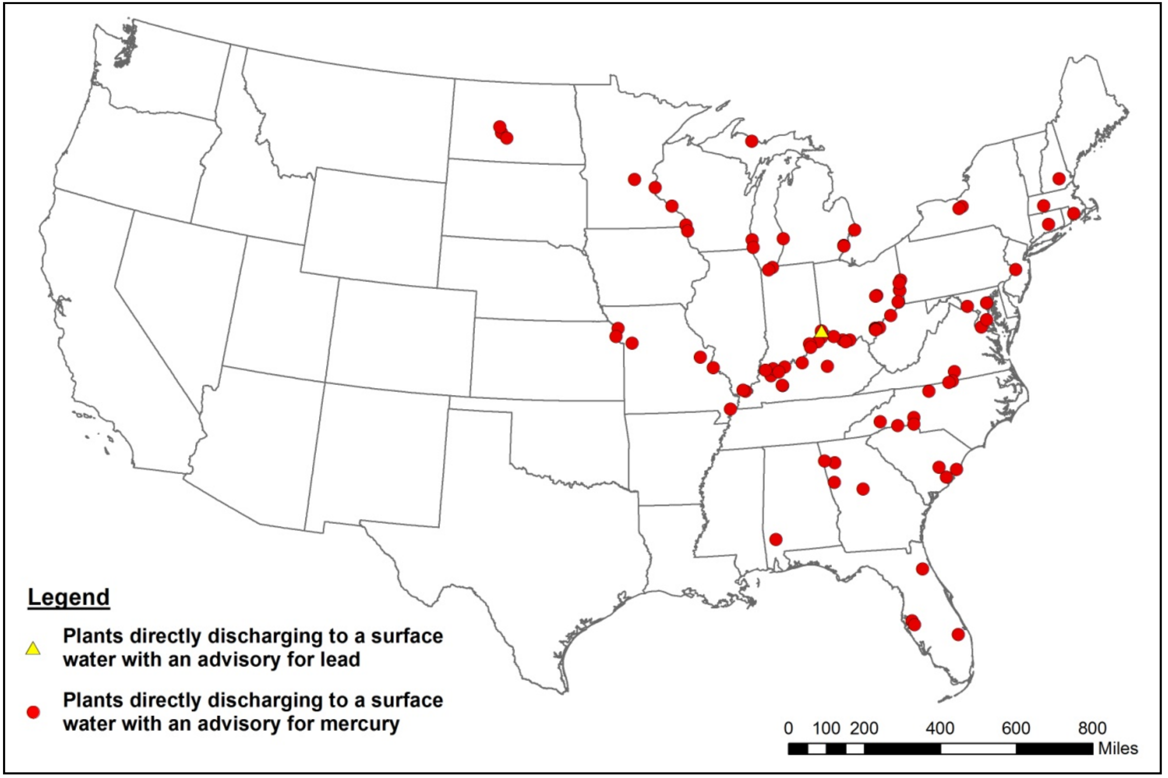

Figure 3-4. Location of Plants that Directly Discharge to a Surface Water with a Fish Consumption Advisory

3.4.5 Proximity to Threatened and Endangered Species Habitats

United States Environmental Protection Agency | Office of Water Washington, DC 20460 | EPA-821-R-15-006 September 2015

Environmental Assessment for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category

United States Environmental Protection Agency

Environmental Assessment for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category

EPA-821-R-15-006

September 2015

U.S. Environmental Protection Agency
Office of Water (4303T)
Engineering and Analysis Division
1200 Pennsylvania Avenue, NW
Washington, DC 20460

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ACRONYMS

ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation factor
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
BAT	Best Available Technology Economically Achievable
BCF	Bioconcentration factor
BPT	Best Practicable Control Technology Currently Available
CBI	Confidential business information
CCR	Coal combustion residuals
CFR	Code of Federal Regulations
CSCL	Chemical stressor concentration limit
CSF	Cancer slope factor
CWA	Clean Water Act
DBP	Disinfection by-products
DCN	Document control number
DMR	Discharge monitoring report
DOE	Department of Energy
EA	Environmental assessment
EF	Enrichment factors
EFDC	Environmental Fluid Dynamics Code
ELGs	Effluent Limitations Guidelines and Standards
EP	Extraction procedure
EPA	U.S. Environmental Protection Agency
ER	Exposure-response
ESA	Endangered Species Act
FGD	Flue gas desulfurization
FGMC	Flue gas mercury control
FR	Federal Register
FWS	U.S. Fish and Wildlife Service
IRIS	Integrated Risk Information System
IRW	Immediate receiving water
Kd_{sw}	Suspended sediment-surface water partition coefficient
LADD	Lifetime average daily dose
lbs/yr	Pounds per year
LC_{50}	Median lethal concentration
LECR	Lifetime excess cancer risk

MCL	Maximum contaminant level
MRL	Minimal risk level
MGD	Million gallons per day
mg/day	Milligrams per day
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MW	Megawatt
MWh	Megawatt-hour
NEHC	No effect hazard concentration
NHDPlus	National Hydrography Dataset Plus
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No-observed-adverse-effect level
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
NSPS	New Source Performance Standards
NWIS	National Water Information System
ORCR	Office of Resource Conservation and Recovery
OSWER	Office of Solid Waste and Emergency Response
PCB	Polychlorinated biphenyls
POC	Pollutant of concern
POTW	Publicly owned treatment works
ppm	Parts per million
PSES	Pretreatment Standards for Existing Sources
PSNS	Pretreatment Standards for New Sources
RCRA	Resource Conservation and Recovery Act
RfD	Reference dose
RIA	Regulatory impact analysis
RSEI	Risk-Screening Environmental Indicators
SDWA	Safe Drinking Water Act
SQuiRT	Screening Quick Reference Table
STORET	EPA's STOrage and RETrieval Data Warehouse
T3	Trophic level 3
T4	Trophic level 4
TC	Toxicity characteristic
TCLP	Toxicity characteristic leaching procedure
TDD	Technical Development Document
TDS	Total dissolved solids
TEL	Threshold effects level

TMDL	Total maximum daily load
TOC	Total organic carbon
TRI	Toxics Release Inventory
TSS	Total suspended solids
TTF	Trophic transfer factor
TTHM	Total trihalomethanes
TWF	Toxic weighting factor
TWPE	Toxic weighted pound equivalent
μg/g	Micrograms per gram
μg/L	Micrograms per liter
USGS	United States Geological Survey
WASP	Water Quality Analysis Simulation Program
WHO	World Health Organization
WMA	Wildlife Management Area
WQI	Water quality index

GLOSSARY

Acute – having a sudden onset or lasting a short time. An acute stimulus is severe enough to induce a response rapidly. The word acute can be used to define either the exposure or the response to an exposure (effect). The duration of an acute aquatic toxicity test is generally 4 days or less and mortality is the response usually measured.

Aquifer – an underground formation or group of formations in rocks and soils containing enough ground water to supply wells and springs.

Benthic – pertaining to the bottom (bed) of a waterbody.

Bioaccumulation – general term describing a process by which chemicals are taken up by an organism either directly from exposure to a contaminated medium or by consumption of food containing the chemical, resulting in a net accumulation of the chemical by an organism due to uptake from all routes of exposure.

Bioavailability – the ability of a particular contaminant to be assimilated into the tissues of exposed organisms.

Biomagnification – result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain.

Bottom ash – the ash, including boiler slag, which settles in the furnace or is dislodged from furnace walls. Economizer ash is included when it is collected with bottom ash.

Chronic – involving a stimulus that is lingering or continues for a long time; often signifies periods from several weeks to years, depending on the reproductive life cycle of the species. This term can be used to define either the exposure or the response to an exposure (effect). Chronic exposures typically induce a biological response of relatively slow progress and long duration.

Combustion residuals – solid wastes associated with combustion-related power plant processes, including fly and bottom ash from coal-, petroleum coke-, or oil-fired units; flue gas desulfurization (FGD) solids; flue gas mercury control wastes; and other wastewater treatment solids associated with steam electric power plant wastewater. In addition to the residuals that are associated with coal combustion, this also includes residuals associated with the combustion of other fossil fuels.

Combustion residual leachate – leachate from landfills or surface impoundments containing combustion residuals. Leachate is composed of liquid, including any suspended or dissolved constituents in the liquid, that has percolated through waste or other materials emplaced in a landfill, or that passes through the surface impoundment's containment structure (*e.g.*, bottom, dikes, berms). Combustion residual leachate includes seepage and/or leakage from a combustion residual landfill or impoundment unit. Combustion residual leachate includes wastewater from landfills and surface impoundments located on non-adjoining property when under the operational control of the permitted facility.

Criterion continuous concentration – an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely (chronic exposure) without resulting in an unacceptable effect.

Criterion maximum concentration – an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly (acute exposure) without resulting in an unacceptable effect.

Direct discharge – (a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source," or (b) any addition of any pollutant or combination of pollutant to waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges though pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any "indirect discharger."

Edema – swelling caused by fluid in body tissues.

Effluent limitation – under Clean Water Act (CWA) section 502(11), any restriction, including schedules of compliance, established by a state or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance.

Evaluated wastestreams – subset of steam electric power plant wastewaters evaluated in the environmental assessment (EA) and Benefits and Cost Analysis that includes FGD wastewater, fly ash transport water, bottom ash transport water, and combustion residual leachate collected from landfills or surface impoundments.

Exposure – the contact or co-occurrence of a stressor with a receptor.

Flue gas desulfurization (FGD) wastewater – wastewater generated specifically from the wet FGD scrubber system that comes into contact with the flue gas or the FGD solids, including but not limited to, the blowdown or purge from the FGD scrubber system, overflow or underflow from the solids separation process, FGD solids wash water, and the filtrate from the solids dewatering process. Wastewater generated from cleaning the FGD scrubber, cleaning FGD solids separation equipment, cleaning the FGD solids dewatering equipment, or that is collected in floor drains in the FGD process area is not considered FGD wastewater.

Flue gas mercury control (FGMC) wastewater – wastewater generated from an air pollution control system installed or operated for the purpose of removing mercury from flue gas. This includes fly ash collection systems when the particulate control system follows sorbent injection or other controls to remove mercury from flue gas. FGD wastewater generated at plants using oxidizing agents to remove mercury in the FGD system and not in a separate FGMC system is not included in this definition.

Fly ash – the ash that is carried out of the furnace by a gas stream and collected by a capture device such as a mechanical precipitator, electrostatic precipitator, and/or fabric filter. Economizer ash is included in this definition when it is collected with fly ash. Ash is not included in this definition when it is collected in wet scrubber air pollution control systems whose primary purpose is particulate removal.

Gasification wastewater – any wastewater generated at an integrated gasification combined cycle operation from the gasifier or the syngas cleaning, combustion, and cooling processes. Gasification wastewater includes, but is not limited to the following: sour/grey water; CO2/steam stripper wastewater; sulfur recovery unit blowdown, and wastewater resulting from slag handling or fly ash handling, particulate removal, halogen removal, or trace organic removal. Air separation unit blowdown, noncontact cooling water, and runoff from fuel and/or byproduct piles are not considered gasification wastewater. Wastewater that is collected intermittently in floor drains in the gasification process areas from leaks, spills and cleaning occurring during normal operation of the gasification operation is not considered gasification wastewater.

Ground water – water that is found in the saturated part of the ground underneath the land surface.

Hematological – pertaining to or emanating from blood cells.

Histopathological – pertaining to tissue changes.

Immediate receiving water – the segment of a receiving water where discharges from a point source enter the surface water. The segment is defined by the hydrographic dataset supporting the analysis (*e.g.*, National Hydrography Dataset Plus, Version 1).

Impaired waters – a surface water is classified as a 303(d) impaired water when pollutant concentrations exceed water quality standards and the surface water can no longer meet its designated uses (*e.g.*, drinking, recreation, and aquatic habitat).

Indirect discharge – wastewater discharged or otherwise introduced to a publicly owned treatment works (POTW).

Invertebrates – animals without a backbone or spinal column; *macroinvertebrates* are invertebrates that can be seen without a microscope (macro), such as aquatic insects, worms, clams, snails, and crustaceans.

Landfill – a disposal facility or part of a facility where solid waste, sludges, or other process residuals are placed in or on any natural or manmade formation in the earth for disposal and which is not a storage pile, a land treatment facility, a surface impoundment, an underground injection well, a salt dome or salt bed formation, an underground mine, a cave, or a corrective action management unit.

Leachate – see *combustion residual leachate*.

Lentic – pertaining to still or slow-moving water, such as lakes or ponds.

Lethal – causing death by direct action.

Lotic – pertaining to flowing water, such as streams and rivers.

Median lethal concentration (LC_{50}) – a statistically or graphically estimated concentration that is expected to be lethal to 50 percent of a group of organisms under specified conditions.

Mortality – death rate or proportion of deaths in a population.

Partition coefficient – the ratio of a pollutant concentration in one medium compared to another (*e.g.*, dissolved in the water column, sorbed to suspended sediment, and sorbed to benthic sediment in a receiving water).

Piscivorous – habitually feeds on fish.

Plant-receiving water – the combination of a steam electric power plant and the immediate receiving water into which evaluated wastestreams are discharged from that plant.

Point source – any discernable, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged. The term does not include agricultural stormwater discharges or return flows from irrigated agriculture. See CWA section 502(14), 33 U.S.C. 1362(14); 40 CFR §122.2.

Population – an aggregate of individuals of a species within a specified location in space and time.

Publicly owned treatment works (POTW) – any device or system, owned by a state or municipality, used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature that is owned by a state or municipality. This includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment. See CWA section 212, 33 U.S.C. 1292; 40 CFR §§122.2, 403.3.

Receptor – the ecological or human entity exposed to a stressor.

Receiving water – surface waters into which treated waste or untreated waste are discharged, including those portions of the surface water downstream from the point source.

Sediment – particulate material lying below water.

Sensitivity – in relation to toxic substances, organisms that are more sensitive exhibit adverse (toxic) effects at lower exposure levels than organisms that are less sensitive.

Steam electric power plant wastewater – wastewaters associated with or resulting from the combustion process, including ash transport water from coal-, petroleum coke-, or oil-fired units; air pollution control wastewater (e.g., FGD wastewater, FGMC wastewater, carbon capture wastewater); and leachate from landfills or surface impoundments containing combustion residuals.

Stressor – any physical, chemical, or biological entity that can induce an adverse response.

Sublethal – below the concentration that directly causes death. Exposure to sublethal concentrations of a substance can produce effects on behavior, biochemical, and/or physiological functions, and the structure of cells and tissues in organisms.

Surface water – all waters of the United States, including rivers, streams, lakes, reservoirs, and seas.

Teratogenic – able to disturb the growth and development of an embryo or fetus.

Transport water – any wastewater that is used to convey fly ash, bottom ash, or economizer ash from the ash collection or storage equipment, or boiler, and has direct contact with the ash. Transport water does not include low volume, short duration discharges of wastewater from minor leaks (*e.g.*, leaks from valve packing, pipe flanges, or piping) or minor maintenance events (*e.g.*, replacement of valves or pipe sections).

Trophic level – position of an organism in the food chain.

Toxic pollutants – as identified under the CWA, 65 pollutants and classes of pollutants, of which 126 specific substances have been designated priority toxic pollutants. See Appendix A to 40 CFR §423.

SECTION 1
INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is promulgating revised effluent limitations guidelines and standards (ELGs) for the Steam Electric Power Generating Point Source Category (40 CFR 423). In support of the development of the final rule, EPA conducted an environmental assessment (EA) to evaluate the environmental impact of pollutant loadings released under current (*i.e.*, baseline) discharge practices and assess the potential environmental improvement from pollutant loading removals under the final rule.[1]

Based on evidence in the literature, documented damage cases, and modeled receiving water pollutant concentrations, it is clear that current steam electric power plant wastewater discharge practices impact the water quality in receiving waters, impact the wildlife in the surrounding environments, and pose a human health threat to nearby communities. Substantial evidence exists that metals (*e.g.*, arsenic, cadmium, mercury, selenium) from steam electric power plant wastewater discharges transfer from the aquatic environment to terrestrial food webs, indicating a potential for broader impacts to ecological systems by altering population diversity and community dynamics in the areas surrounding steam electric power plants. Ecosystem recovery from exposure to pollutants in power plant wastewater discharges can be extremely slow, and even short periods of exposure (*e.g.*, less than a year) can cause observable ecological impacts that last for years.

Steam electric power plants discharge wastewater, which contains numerous pollutants,[2] into waterbodies used for recreation and can present a threat to human health. Due to steam electric power plant wastewater discharges, fish advisories have been issued to protect the public from exposure to fish with elevated pollutant concentrations. Leaching of pollutants from surface impoundments and landfills containing combustion residuals is known to impact off-site ground water and drinking water wells at concentrations above maximum contaminant level (MCL) drinking water standards, posing a threat to human health.[3]

In this report, EPA uses the term "steam electric power plant wastewater" to represent all combustion-related wastewaters that contain pollutants covered by the revised steam electric ELGs. For the EA, EPA evaluated only a subset of the wastestreams: flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, and combustion residual

[1] The Clean Water Act does not require that EPA assess the water-related environmental impacts, or the benefits, of its ELGs, and EPA did not make its decision on the final steam electric ELGs based on the expected benefits of the rule. EPA does, however, inform itself of the benefits of its rule, as required by Executive Order 12866. See the Benefits and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generation Point Source Category (EPA-821-R-15-005).

[2] The steam electric ELGs control the discharge of pollutants to surface waters and do not specifically regulate "wastewater." To allow for more concise discussion in this EA report, EPA occasionally refers to "wastewater" discharges and impacts without specifically referencing the pollutants in the wastewater discharges.

[3] In this EA, EPA evaluated the threats to human health and the environment associated with pollutants leaching into ground water from surface impoundments and landfills containing combustion residuals. If these leached pollutants do not constitute the discharge of a pollutant to surface waters, then they are not controlled under the steam electric ELGs. While the Coal Combustion Residuals (CCR) rulemaking is the major controlling action for these pollutant releases to ground water, the ELGs could indirectly reduce impacts to ground water. These secondary improvements are discussed in Section 7.8.

leachate collected from landfills or surface impoundments). The goal of the EA was to answer the following five questions regarding pollutant loadings from the evaluated wastestreams:

- What are the environmental concerns under current (*i.e.*, baseline) discharge practices?
- What are the environmental and exposure pathways for steam electric power plant wastewater discharges to impact water quality, wildlife, and human health?
- What are the baseline environmental impacts to water quality and wildlife?
- What are the impacts to human health from baseline discharges?
- What are the potential improvements to water quality, wildlife, and human health under the final rule?

The EA evaluated environmental concerns and potential exposures (wildlife and humans) to pollutants commonly found in wastewater discharges from steam electric power plants. EPA completed both qualitative and quantitative analyses. Qualitative analyses included reviewing documented site impacts in literature and damage cases; assessing the pollutant loadings to receiving waters and sensitive environments; and reviewing the effects of pollutant exposure on ecological and human receptors. To quantify baseline impacts and improvements under the final rule, EPA developed computer models to determine pollutant concentrations in the immediate and downstream receiving waters, pollutant concentrations in fish tissue, and exposure doses to ecological and human receptors from fish consumption. EPA compared the values calculated by the models to benchmarks to determine the extent of the environmental impacts nationwide. EPA also developed a model to determine the risk of reproductive impacts among fish and waterfowl that have been exposed, via their diet, to selenium from steam electric power plant wastewater discharges.

This report presents the methodology and results of the qualitative and quantitative analyses performed to evaluate baseline discharges from steam electric power plants and improvements under the final rule. The analyses presented in this report incorporate some adjustments to current conditions in the industry. For example, these analyses account for publicly announced plans from the steam electric power generating industry to retire or modify steam electric generating units at specific power plants. These analyses also account for changes to the industry that are expected to occur as a result of the recent CCR rulemaking by EPA's Office of Solid Waste and Emergency Response (OSWER). These analyses, however, do not reflect changes in the industry that may occur as a result of the Clean Power Plan [Clean Air Act Section 111(d)].[4]

In addition to the EA, the final steam electric ELGs are supported by a number of reports including:

Regulatory Impact Analysis for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generation Point Source Category, Document No. EPA-821-R-15-004. This report presents a profile of the steam electric power generating industry, a summary of the

[4] EPA completed a parallel set of quantitative EA analyses that reflect changes in the industry that may occur as a result of the Clean Power Plan. Appendix I provides the results of those analyses.

costs and impacts associated with the regulatory options, and an assessment of the final rule's impact on employment and small businesses.

Benefits and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generation Point Source Category (Benefits and Cost Analysis), Document No. EPA-821-R-15-005. This report summarizes the monetary benefits and societal costs that result from implementation of the final rule.

Technical Development Document for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (TDD), Document No. EPA-821-R-15-007. This report includes background on the final rule; applicability and summary of the final rule; industry description; wastewater characterization and identification of pollutants of concern; treatment technologies and pollution prevention techniques; and documentation of EPA's engineering analyses to support the final rule including cost estimates, pollutant loadings, and non-water-quality impact assessment.

These reports are available in the public record for the final rule and on EPA's website at http://water.epa.gov/scitech/wastetech/guide/steam_index.cfm.

The ELGs for the Steam Electric Power Generating Point Source Category are based on data generated or obtained in accordance with EPA's Quality Policy and Information Quality Guidelines. EPA's quality assurance and quality control activities for this rulemaking include the development, approval, and implementation of Quality Assurance Project Plans for using environmental data generated or collected from all sampling and analyses, existing databases, and literature searches, and for developing any models that used environmental data. Unless otherwise stated within this document, EPA evaluated the data used and associated data analyses as described in these quality assurance documents to ensure they are of known and documented quality, meet EPA's requirements for objectivity, integrity, and utility, and are appropriate for the intended use.

SECTION 2
BACKGROUND AND SCOPE

The final steam electric effluent limitations guidelines and standards (ELGs) apply to establishments whose generation of electricity is the predominant source of revenue or principal reason for operation, and whose generation results primarily from a process utilizing fossil-type fuels (coal, oil, or gas), fuel derived from fossil fuel (*e.g.*, petroleum coke, synthesis gas), or nuclear fuel in conjunction with a thermal cycle using the steam water system as the thermodynamic medium. The final rule applies to discharges associated with both the combustion turbine and steam turbine portions of a combined cycle generating unit (see 40 CFR 423.10). EPA is revising or establishing best available technology economically achievable (BAT) limitations, new source performance standards (NSPS), pretreatment standards for existing sources (PSES), and pretreatment standards for new sources (PSNS) that apply to certain discharges of seven wastestreams: flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, combustion residual leachate, flue gas mercury control (FGMC) wastewater, gasification wastewater, and nonchemical metal cleaning wastes. See the Technical Development Document (TDD) (EPA-821-R-15-007) for more information on the rule applicability and definitions, industry description, wastestreams and pollutants of concern, treatment technologies, baseline and regulatory option pollutant loadings, costs of implementing treatment technologies, and revised standards.

Many steam electric power plants use large surface impoundments to store and treat wastewaters. These impoundments are hydrologically connected to surface and ground water.

As discussed in Section 1, EPA uses the term "steam electric power plant wastewater" to represent all combustion-related wastewaters covered by the revised steam electric ELGs. For the environmental assessment (EA), EPA evaluated only a subset of the wastestreams (see Table 2-1 below).[5] "Combustion residuals" are the solid wastes associated with combustion-related power plant processes, including fly and bottom ash; FGD solids; FGMC wastes; and other wastewater treatment solids associated with steam electric power plant wastewater. Steam electric power plants generate solid residuals from fuel combustion and from emission control technologies. These solid residuals include fly ash, bottom ash, and FGD solids. Plants remove these solid materials through both wet and dry handling methods. Dry handling typically involves transferring the solids to a storage silo or outdoor storage pile, to be either disposed of in a landfill or, depending on the particular residual,

[5] EPA evaluated technology options associated with FGMC wastewater, gasification wastewater, and nonchemical metal cleaning wastes as part of the regulatory options. However, no plants currently discharge FGMC wastewater, all existing gasification plants are operating the technology used as the basis for the regulatory option, and EPA will continue to reserve BAT/NSPS/PSES/PSNS for nonchemical metal cleaning wastes, as previously established regulations do. Therefore, EPA estimated zero compliance costs and zero pollutant reductions associated with these wastestreams and did not include these three wastestreams in the EA.

used to create beneficial by-products such as wallboard or cement. However, many plants use wet handling systems, which transport the wastes to a surface impoundment (*e.g.*, ash pond) using large quantities of water. For example, in wet systems, bottom ash collects at the bottom of the boiler in a water bath, and the water containing the bottom ash is then typically transported to a surface impoundment for storage and/or disposal. Fly ash may be handled similarly after it is collected from the particulate collection system. The slurry stream exiting wet FGD systems, which contains 10 to 20 percent FGD solids, is typically treated either in a surface impoundment or in an advanced wastewater treatment system, then discharged to a receiving stream or reused in other plant processes. Section 6 of the TDD describes the industry wastestreams in detail. Table 2-1 lists the specific wastestreams evaluated in the EA.

Table 2-1. Steam Electric Power Plant Wastestreams Evaluated in the EA

Evaluated Wastestream	Description
Fly ash transport water	Water used to convey the fly ash particles removed from the flue gas via a collection system. Untreated ash transport waters contain significant concentrations of total suspended solids (TSS) and metals, including arsenic, calcium, and titanium (see Section 6 of the TDD for further details). The effluent from surface impoundments generally contains low concentrations of TSS; however, metals are still present in the wastewater, predominantly in dissolved form.
Bottom ash transport water	Water used to convey the bottom ash particles collected at the bottom of the boiler. As noted above, untreated ash transport waters contain significant concentrations of TSS and metals.
FGD wastewater	Wastewater generated from a wet FGD scrubber system. Wet FGD systems are used to control sulfur dioxide (SO_2) emissions from the flue gas generated in the plant's boiler. The pollutant concentrations in FGD wastewater vary from plant to plant depending on the coal type, the sorbent used, the materials of construction in the FGD system, the FGD system operation, the level of recycle within the absorber, and the air pollution control systems operated upstream of the FGD system. FGD wastewater contains significant concentrations of chlorides, total dissolved solids (TDS), nutrients, and metals, including bioaccumulative pollutants such as arsenic, mercury, and selenium (see Section 6 of the TDD for further details).
Combustion residual leachate	Collected liquid that has percolated through or drains from a landfill or a surface impoundment, where the steam electric power plant disposes of or stores a variety of wastes from the combustion process. Leachate contains high concentration of metals, such as boron, calcium, chloride, and sodium, similar to FGD wastewaters and ash transport water. The metal concentrations in the leachate are generally lower than those in FGD wastewater and ash transport water (see Section 6 of the TDD for further details).

Surface impoundments accumulate high concentrations of toxic pollutants from fly ash transport water, bottom ash transport water, and FGD wastewater.

Surface impoundments act as a physical treatment process to remove particulate material from wastewater through gravitational settling. The wastewater in surface impoundments can include one specific type of wastewater (*e.g.*, fly ash transport water) or a combination of wastewaters (*e.g.*, fly ash transport water and FGD wastewater). Additionally, plants may transfer wastewater streams from other operations into their on-site impoundments (*e.g.*, cooling tower blowdown or metal cleaning wastes). The wastestreams sent to surface impoundments can also include coal pile runoff. Although coal pile runoff is not the result of a combustion process, it can contain many of the pollutants present in steam electric power plant wastewater. Leachate or seepage may occur from surface impoundments or landfills containing combustion residuals.[6] Regardless of whether they use surface impoundments or an advanced treatment system, steam electric power plants typically discharge wastewater into the natural environment where numerous studies have raised concern regarding the toxicity of these wastestreams [ERG, 2013a; NRC, 2006; Rowe *et al*., 2002; U.S. EPA, 2014a through 2014e]. Previous regulations at 40 CFR 423 control pH and polychlorinated biphenyls (PCBs) discharge from all wastestreams and TSS and oil and grease from ash transport waters and other "low volume wastes" that include air pollution control wastewater (see Section 1 of the TDD). Section 6 of the TDD discusses wastewater characterization and selection of pollutants of concern.

Based on data EPA obtained from the 2010 *Questionnaire for the Steam Electric Power Generating Effluent Guidelines* (Steam Electric Survey), EPA estimates that 1,079 steam electric power plants are subject to the final rule (see Section 4 of the TDD). EPA limited the scope of the EA to those plants that both 1) discharge directly to surface waters and 2) will reduce their pollutant loadings as a result of the regulatory options evaluated, based on EPA projections. Therefore, the EA scope excludes steam electric power plants that meet any of the following criteria:

- Plants that do not discharge any of the wastestreams that are included in the final rule (even if the plant does generate and reuse the wastestream without discharging to surface waters).
- Plants that already comply with final rule or have plans to comply with the final rule prior to the date when the plants would have to meet the new limitations and standards.

[6] In this EA, EPA evaluated the threats to human health and the environment associated with pollutants leaching into ground water from surface impoundments and landfills containing combustion residuals. If these leached pollutants do not constitute the discharge of a pollutant to surface waters, then they are not controlled under the steam electric ELGs. While the CCR rulemaking is the major controlling action for these pollutant releases to ground water, the ELGs could indirectly reduce impacts to ground water. These secondary improvements are discussed in Section 7.8.

- Plants that that have announced plans to retire steam generating units (that would otherwise be subject to the final rule) prior to the date that the plants would have to meet the new limitations and standards.
- Plants that, based on EPA projections, will either convert to dry ash handling or install tank-based FGD wastewater treatment systems to comply with the CCR rulemaking.
- Plants that discharge only to publicly owned treatment works (POTWs).

In the EA, EPA evaluated the current impact and potential improvement to the environment and human health from 195 plants that discharge directly to surface waters and that EPA projects will reduce pollutant loadings as a result of the regulatory options evaluated. Table 2-2 presents the number of plants by discharge type (direct or indirect) included in the cost and loadings analysis presented in Sections 9 and 10 of the TDD.

Table 2-2. Number of Plants Evaluated in the EA

Plant Description	Number of Plants
Number of Plants in Scope of Final Rule	
Plants that fall under the applicability of the final rule (40 CFR 423)	1,079
Cost and Loadings Analysis	
Plants for which EPA calculated loadings in the cost and loadings analyses (see Sections 9 and 10 of the TDD)	202
Plants that discharge only to surface waters (direct discharger)	191
Plants that discharge only to a POTW (indirect discharger)	7
Plants that discharge to surface waters and to a POTW (direct and indirect discharger)	4
Environmental Assessment	
Plants evaluated in the EA (includes all direct dischargers)[a]	195

a – For the pollutant loadings and removals presented in this report, EPA included indirect dischargers to protect confidential business information.

These 195 steam electric power plants discharge to the 222 immediate receiving waters illustrated in Figure 2-1 (some plants discharge to multiple receiving waters). The EA includes qualitative analysis of the pollutant loadings in evaluated wastestreams discharged from these plants and the associated potential for environmental and human health impacts. As discussed in Section 5, EPA developed and executed a national-scale immediate receiving water (IRW) model to perform further quantitative modeling of the water quality, wildlife, and human health impacts associated with discharges from the majority of these plants. The IRW model, which excludes discharges to the Great Lakes and estuaries, encompasses 188 steam electric power plants that discharge to 209 immediate receiving waters. As discussed in Section 8, EPA also performed more detailed case study modeling of discharges from six steam electric power plants. Figure 2-1 indicates the immediate receiving waters included in the IRW modeling and case study modeling scopes.

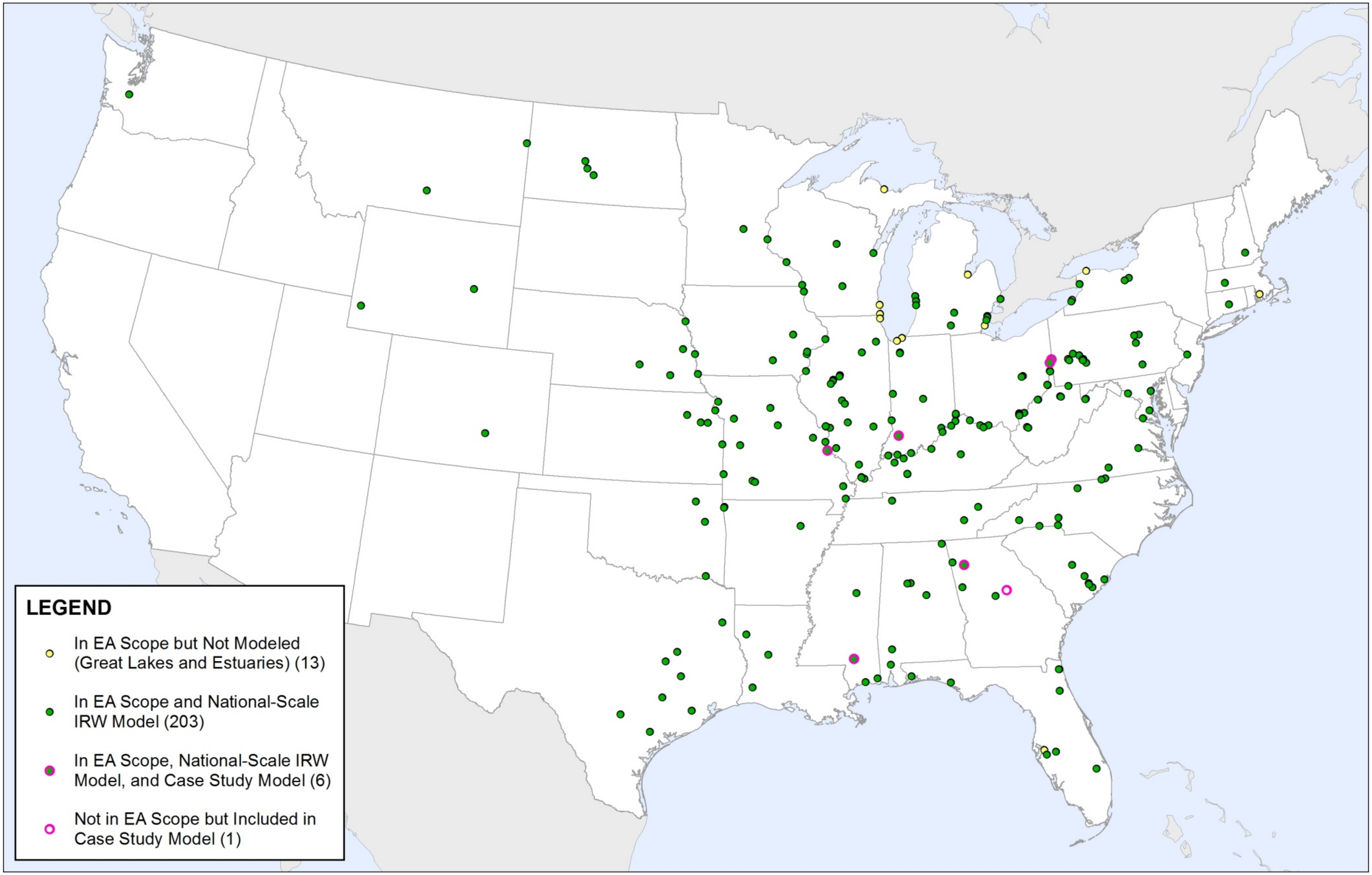

Figure 2-1. Locations and Counts of Immediate Receiving Waters in EA Scope and Modeling Analyses

EPA used the results from quantitative and qualitative assessments combined with the literature review to evaluate and describe the environmental impacts caused by the discharge of the evaluated wastestreams. EPA organized the remainder of this report into the following sections:

- Section 3 describes the environmental concerns associated with the evaluated wastestreams, including a discussion of the pollutants of concern and a review of damage cases and other documented site impacts showing negative impacts to surface water and ground water.
- Section 4 outlines how ecological and human receptors may be exposed to pollutants (i.e., environmental pathways), describes the factors that control environmental impacts for each pathway, and gives an overview of the methodology used to quantitatively evaluate the environmental and human health impacts.
- Section 5 presents the modeling performed to support the EA including an overview of the national-scale IRW model and the ecological risk model.
- Section 6 presents the environmental and human health impacts based on qualitative review and quantitative assessments (modeling of plant-specific discharges) of current (baseline) discharges.
- Section 7 presents the improvements to the environment and human health estimated from the implementation of the regulatory options.
- Section 8 describes EPA's case study modeling of discharges from six steam electric power plants, presents the environmental and human health impacts under baseline conditions, and discusses the modeled improvements under the final rule.
- Section 9 presents EPA's conclusions on the environmental and human health improvements estimated under the final rule.

SECTION 3
ENVIRONMENTAL AND HUMAN HEALTH CONCERNS

Current scientific literature indicates that steam electric power plant wastewater is not a benign waste [NRC, 2006; Rowe *et al*., 2002]. Many of the common pollutants (*e.g.*, selenium, mercury, and arsenic) found in the evaluated wastestreams (*i.e.*, fly ash and bottom ash transport water, flue gas desulfurization (FGD) wastewater, and combustion residual leachate) present an increased ecological threat due to their tendency to persist in the environment and bioaccumulate in organisms. This often results in slow ecological recovery times following exposure. The toxic impacts of steam electric power plant wastewater discharges on surface waters have been well documented in studies of over 30 aquatic ecosystems receiving discharges from steam electric power plants.[7]

Documented exceedances of drinking water maximum contaminant levels (MCLs) downstream of steam electric power plants and the issuance of fish advisories in receiving waters indicate an ongoing human health concern caused by steam electric power plant wastewater discharges. EPA identified more than 30 documented cases where ground water contamination from surface impoundments extended beyond the plant boundaries, illustrating the threat to ground water drinking water sources [ERG, 2015m].[8] In other damage cases, EPA documented locations where selenium in power plant wastewater discharges resulted in fish consumption advisories being issued for surface waters.

The pollutants commonly discharged in the evaluated wastestreams cause environmental harm by contaminating surface water and ground water (*e.g.*, selenium concentrations from steam electric power plants have resulted in fish kills). After being released into the environment, pollutants can reside for a long time in the receiving waters, bioaccumulating and binding with the sediment. There is documented evidence of slow ecological recovery as a result of these pollutant discharges. Steam electric power plants also discharge to sensitive environments (*e.g.*, impaired waters, waters under a fish consumption advisory, Great Lakes, valuable estuaries, and drinking water sources). Some impacts might not be realized for years due to the persistent and bioaccumulative nature of the pollutants released. Based on EPA's calculated baseline pollutant loadings, the total amount of toxic pollutants currently being released in wastewater discharges from steam electric power plants is significant and raises concerns regarding the long-term impacts to aquatic organisms, wildlife, and humans that are exposed to these pollutants. For details on the pollutant loadings analysis, see Section 10 of the Technical Development Document (TDD) (EPA-821-R-15-007).

This section details environmental concerns associated with wastewater discharges from steam electric power plants including changes in surface water quality and sediment contamination levels; changes in ground water quality and potential contamination of private

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[7] Sources include ATSDR, 1998a, 1998b and 1998c; Charlotte Observer, 2010; DOE, 1992; EIP, 2010a and 2010b; Roe *et al.,* 2005; Sorensen *et al.,* 1983; Sorensen, 1988; Specht *et al.,* 1984; and Vengosh *et al.,* 2009.

[8] In this EA, EPA evaluated the threats to human health and the environment associated with pollutants leaching into ground water from surface impoundments and landfills containing combustion residuals. If these leached pollutants do not constitute the discharge of a pollutant to surface waters, then they are not controlled under the steam electric ELGs. While the Coal Combustion Residuals (CCR) rulemaking is the major controlling action for these pollutant releases to ground water, the ELGs could indirectly reduce impacts to ground water. These secondary improvements are discussed in Section 7.8.

drinking water wells; bioaccumulation of contaminants in fish and aquatic life, fish eaten by piscivorous wildlife (*i.e.*, fish-eating wildlife), and fish eaten by humans; and toxic effects on fish and aquatic life. The section is organized into the following subsections:

- Section 3.1: Types of pollutants discharged in steam electric power plant wastewater.
- Section 3.2: Pollutant loadings associated with steam electric power plant wastewater.
- Section 3.3: Environmental impacts from steam electric power plant wastewater, including ecological impacts, human health effects, damage cases and other documented site impacts, and potential for impacts to occur in other locations.
- Section 3.4: Sensitive environments, including pollutant loadings to the Great Lakes and Chesapeake Bay watersheds, impaired waters, waters issued fish advisories, threatened and endangered species habitats, and drinking water resources.
- Section 3.5: Long recovery times.

3.1 TYPES OF POLLUTANTS DISCHARGED IN STEAM ELECTRIC POWER PLANT WASTEWATER

This section provides an overview of the pollutants in steam electric power plant wastewater discharges that are frequently cited as affecting local wildlife or pose a threat to human health. A number of variables can affect the composition of steam electric power plant wastewater, including fuel composition, type of combustion process, air pollution control technologies implemented, and management techniques used to dispose of the wastewater [Carlson and Adriano, 1993]. In addition, commingling steam electric power plant wastewater with other wastestreams from the plant in surface impoundments can result in a chemically complex effluent that is released to the environment [Rowe *et al*., 2002]. To identify pollutants of concern for the final rule, EPA used the following sources of wastewater characterization data: EPA's field sampling program; data supplied by industry or members of the public (*e.g.,* in questionnaire responses and public comments on the proposed rule); and various literature sources (see Section 6 of the TDD and the preamble to the final rule for further details on pollutants of concern). Pollutants such as metals, nutrients, and total dissolved solids (TDS), including chloride and bromides, are the common pollutants found in steam electric power plant wastewater that have been associated with documented environmental impacts or could have the potential to cause environmental impacts based on the loadings and concentrations present in the evaluated wastestreams.

3.1.1 Metals and Toxic Bioaccumulative Pollutants

Studies commonly cite metals and toxic bioaccumulative pollutants (*e.g.,* mercury and selenium) as the primary cause of ecological damage following exposure to steam electric power plant wastewater [Rowe *et al*., 1996; Lemly, 1997a; Hopkins *et al*., 2000; Rowe *et al*., 2002] (see Section 3.3.1). An important consideration in evaluating these pollutants is their bioavailability– the ability of a particular contaminant to be assimilated into the tissues of exposed organisms. A pollutant's bioavailability is affected by the characteristics of both the pollutant and surrounding environment (*e.g.*, temperature, pH, salinity, oxidation-reduction (redox) potential, total organic content, suspended particulate content, and water velocity). Environmental conditions influence the tendency of a dissolved pollutant to remain in solution or precipitate out of solution, sorb to either organic or inorganic suspended matter in the water column, or sorb to the mixture of

materials (*e.g.*, clays and humic matter) found in sediments [U.S. EPA, 2007a]. Pollutants that precipitate out of solution can become concentrated in the sediments of a waterbody. Regardless, organisms will bioaccumulate pollutants either by consuming pollutant-enriched sediments and suspended particles, and/or by filtering ambient water containing dissolved pollutants.

Table 3-1 lists some of the common metals and toxic bioaccumulative pollutants found in steam electric power plant wastewater that have been associated with documented health and environmental impacts or could potentially cause health and environmental impacts based on the loadings and concentrations present in the wastewater. Table 3-1 is intended to highlight the pollutants of concern in steam electric power plant wastewater that are associated with health and environmental impacts; it does not include all pollutants that may cause adverse impacts. Metals and toxic bioaccumulative pollutants in steam electric power plant wastewater are present in both soluble (*i.e.*, dissolved) and particulate (*i.e.*, suspended) form. For example, EPA sampling data collected for FGD wastewater in support of the steam electric ELGs shows that some pollutants such as arsenic are present mostly in particulate form while other pollutants such as selenium and boron are present mostly in soluble form. The remainder of the section provides additional details on several key metals included in the environmental assessment (EA).

Table 3-1. Key Metals and Toxic Bioaccumulative Pollutants Found In Steam Electric Power Plant Wastewater

Pollutant	Examples of Potential Health and Environmental Concerns
Aluminum	Aluminum contamination can lead to the inability of fish to maintain the balance of their fluids and is associated with damage to amphibian eggs and larvae, mostly in areas under acid stress. Human exposure to high concentrations has been linked to Alzheimer's disease.
Arsenic [a]	Arsenic contamination causes liver poisoning, developmental abnormalities, behavioral impairments, metabolic failure, reduced growth, and appetite loss in fish and is associated with an increased risk of the liver and bladder cancer in humans. Arsenic is also a potent endocrine disruptor at low, environmentally relevant levels. Non-cancer impacts to humans can include dermal, cardiovascular, and respiratory effects. Negative impacts can occur both after high-dose exposure and repeated lower-dose exposures. Chronic exposure via drinking water has been associated with excess incidence of miscarriages, stillbirths, preterm births, and low-birth weights.
Boron	Boron can be toxic to vegetation and to wildlife at certain water concentrations and dietary levels. Human exposure to high concentrations can cause nausea, vomiting, and diarrhea.
Cadmium	Cadmium contamination can lead to developmental impairments in wildlife and skeletal malformations in fish. Human exposure to high concentrations in drinking water and food can irritate the stomach, leading to vomiting and diarrhea, and sometimes death. Chronic oral exposure via diet or drinking water to lower concentrations can lead to kidney damage and weakened bones.
Chromium [b]	Chromium is not known to bioaccumulate in fish; however, high concentrations of chromium can damage gills, reduce growth, and alter metabolism in fish. Human exposure to high concentrations can cause gastrointestinal bleeding and lung problems.
Copper	Copper contamination can lead to reproductive failure, gill damage, and reduced sense of smell in fish. Human exposure to high concentrations can cause nausea, vomiting, diarrhea, and liver and kidney damage.
Iron	Iron contamination can reduce growth, increase susceptibility to injury and disease, and decrease egg hatchability in fish. Human exposure to high concentrations can cause metabolic changes and damage to the pancreas, liver, spleen, and heart.
Lead	Lead contamination can delay embryonic development, suppress reproduction, and inhibit growth in fish. Human exposure to high concentrations in drinking water can cause serious damage to the brain, kidneys, nervous system, and red blood cells.

Table 3-1. Key Metals and Toxic Bioaccumulative Pollutants Found In Steam Electric Power Plant Wastewater

Pollutant	Examples of Potential Health and Environmental Concerns
Manganese	Manganese primarily accumulates in organisms lower in the food chain such as phytoplankton, algae, mollusks, and some fish. Although high levels can be toxic to humans, manganese is not generally considered toxic when ingested. The most common impacts due to human exposure to high concentrations involve the nervous system.
Mercury [c]	Once in the environment, mercury can convert into methylmercury, increasing the potential for bioaccumulation. Methylmercury contamination can reduce growth and reproductive success in fish and invertebrates. Human exposure at levels above the MCL for relatively short periods can result in kidney and brain damage. Fetuses, infants, and children are particularly susceptible to impaired neurological development from methylmercury exposure.
Nickel	At low concentrations, nickel can inhibit the growth of microorganisms and algae. Nickel toxicity in fish and aquatic invertebrates varies among species and can damage the lungs, immune system, liver, and kidneys. Human exposure to high concentrations can cause gastrointestinal and kidney damage.
Selenium [d]	Selenium readily bioaccumulates. Elevated concentrations have caused fish kills and numerous sublethal effects (*e.g.*, organ damage, decreased growth rates, reproductive failure) to aquatic and terrestrial organisms. In humans, short-term exposure at levels above the MCL can cause hair and fingernail changes, damage to the peripheral nervous system, and fatigue and irritability. Long-term exposure can damage the kidney, liver, and nervous and circulatory systems.
Thallium	In humans, short-term exposure to thallium can lead to neurological symptoms, alopecia, gastrointestinal effects, and reproductive and developmental damage. Long-term exposures at levels above the MCL change blood chemistry and damage liver, kidney, intestinal and testicular tissues and cause hair loss.
Vanadium	Vanadium contamination can increase blood pressure and cause neurological effects in animals. There are very few reported cases of oral exposure to vanadium in humans; however, a few reported incidences documented diarrhea and stomach cramps. It also has been linked to the development of some neurological disorders and cardiovascular diseases.
Zinc	Zinc contamination changes behavior, reduces oxygen supply, and impairs reproduction in fish. In humans, short-term exposure can cause nausea, vomiting, and stomach cramps. Long-term exposure can cause anemia.

a – Arsenic exists in two primary forms: arsenic III (arsenite) and arsenic V (arsenate).

b – Chromium exists in two primary forms: chromium III oxide and chromium VI (hexavalent chromium).

c – The EA evaluated two forms of mercury: total mercury and methylmercury.

d – Selenium exists in two primary forms: selenium IV (selenite) and selenium VI (selenate).

Selenium

Selenium is the most frequently cited pollutant associated with documented environmental impacts to ecological receptors following exposure to steam electric power plant wastewater [NRC, 2006]. The toxic potential of selenium is related to its chemical form and solubility. The predominant chemical forms of selenium in aquatic systems that receive steam electric power plant wastewater discharges are selenite and selenate [Besser *et al*., 1996]. The uptake of selenium by aquatic organisms is controlled by dissolved oxygen levels, hardness, pH, salinity, temperature, and the other chemical constituents present [NPS, 1997]. In alkaline conditions, selenite [Se(IV)] will oxidize in the presence of oxygen to become selenate [Se(VI)]; selenate is both stable and soluble and is the commonly found form of the chemical in alkaline soils and waters. In acidic conditions, selenite is insoluble due to its tendency to bind to iron and aluminum oxides [WHO, 1987]. Organic forms of selenium are more bioavailable for uptake than selenate and selenite and may play an important role determining selenium toxicity in exposed aquatic organisms [Besser *et al*., 1993; Rosetta and Knight, 1995].

The extent to which selenium is found in ecological receptors is affected by bioaccumulation, biomagnification, and maternal transfer. Bioaccumulation occurs when an organism absorbs a toxic substance through food and exposure to the environment at a faster rate than the body can remove the substance. The bioaccumulation of selenium is of particular concern due to its potential to impact higher trophic levels through biomagnification [Coughlan and Velte, 1989] and offspring through maternal transfer [Hopkins *et al*., 2006; Nagle *et al*., 2001]. A laboratory study demonstrated that diet can be an important source of trace element exposure in aquatic snakes and potentially other amphibians [Hopkins *et al*., 2002]. Hopkins reported that the snakes accumulated significant concentrations of the trace elements, most notably selenium. This study also revealed that amphibian prey species are able to migrate considerable distances and can therefore be exposed to toxic levels of selenium even if they do not inhabit a contaminated site. Because of bioaccumulation and biomagnification, selenium-related environmental impacts can linger for years even after exposure to steam electric power plant wastewater has ceased [Rowe *et al*., 2002].

Toxic Pollutant Impacts to Ecological Receptors

- Selenium discharges have caused numerous cases of fish kills and population decline due to reproductive impacts. Bioaccumulation can cause selenium-related environmental impacts to linger for years even after exposure to steam electric power plant wastewater has ceased.
- Fish and invertebrates exposed to steam electric power plant wastewater have exhibited elevated mercury levels in their tissues and developed sublethal effects such as reduced growth and reproductive success.
- Elevated arsenic tissue concentrations are associated with several biological impacts such as liver tissue death, developmental abnormalities, and reduced growth.

Selenium-related impacts observed by scientists include lethal effects such as fish kills, sublethal effects such as histopathological changes and damage to reproductive and developmental success, and the impacts of these effects on aquatic populations and communities. In a 1991 study, Sorensen found that dissolved selenium levels as low as 3 to 8 micrograms per liter (µg/L) in aquatic environments can be life-threatening to fish [NPS, 1997]. Section 3.3.1 presents further details regarding the lethal and sublethal effects on aquatic organisms caused by selenium from steam electric power plant wastewater.

In addition to ecological impacts, EPA has documented numerous damage cases where selenium in steam electric power plant wastewater discharges resulted in fish consumption advisories being issued for surface waters and selenium MCLs being exceeded in ground water, suggesting that selenium concentrations in power plant wastewater have the potential to impact human health [NRC, 2006; U.S. EPA, 2014a through 2014e]. Short-term exposure at levels above the MCL, 0.05 mg/L [U.S. EPA, 2009e], can cause hair and fingernail changes, damage to the peripheral nervous system, and fatigue and irritability in humans. Long-term exposure can damage the kidney, liver, and nervous and circulatory systems.

Mercury

Mercury is a volatile metal and highly toxic compound that represents an environmental and human health threat even in small concentrations. One of the primary environmental concerns regarding mercury concentrations in steam electric power plant wastewater is the potential for methylmercury to form in combustion residual surface impoundments and constructed wetlands prior to discharge and in surface waters following discharge. Methylmercury is an organic form of mercury that readily bioaccumulates in fish and other organisms and is associated with high rates of reproductive failure [WHO, 1976]. Bacteria found in anaerobic conditions, such as those that may be present in sediments found on the bottom of combustion residual surface impoundments or in river sediments, convert mercury to methylmercury through a process called methylation [WHO, 1976]. Microbial methylation rates increase in acidic and anoxic environments with high concentrations of organic matter. Sublethal effects from mercury exposure include reduced growth and reproductive success, metabolic changes, and abnormalities of the liver and kidneys. Human exposure at levels above the MCL, 0.002 mg/L [U.S. EPA, 2009e], for relatively short periods of time can result in kidney and brain damage. Pregnant women who are exposed to mercury can pass the contaminant to their developing fetus, leading to possible mental retardation and damage to other parts of the nervous system [ATSDR, 1999]. Studies have documented fish and invertebrates exposed to mercury from steam electric power plant wastewater exhibiting elevated levels of mercury in their tissues and developing sublethal effects such as reduced growth and reproductive success [Rowe *et al*., 2002].

Toxic Pollutant Impacts to Human Receptors

- Pregnant women exposed to mercury can pass the contaminant to their developing fetus, leading to possible mental retardation and damage to other parts of the nervous system.
- Inorganic arsenic is a carcinogen (*i.e.*, causes cancer). Cadmium is a probable carcinogen.
- Human exposure to high concentrations of lead in drinking water can cause serious damage to the brain, kidneys, nervous system, and red blood cells, especially in children.

Arsenic

Arsenic, like selenium, is of concern because it is soluble in near-neutral pH and in alkaline conditions, which are commonly associated with steam electric power plant wastewater. As a soluble pollutant, arsenic leaches into ground water and is highly mobile. Arsenic is frequently observed at elevated concentrations at sites located downstream from combustion residual surface impoundments [NRC, 2006]. Inorganic arsenic, a carcinogen, is found in natural and drinking waters mainly as trivalent arsenite (As(III)) or pentavalent arsenate (As(V)) [WHO, 2001]. Both the arsenite and arsenate forms are highly soluble in water.

Arsenic is also of concern due to its tendency to bioaccumulate in aquatic communities and potentially impact higher-trophic-level organisms in the area. For example, studies have documented water snakes, which feed on fish and amphibians, with arsenic tissue concentrations higher than their prey [Rowe *et al*., 2002]. Elevated arsenic tissue concentrations are associated with several biological impacts such as liver tissue death, developmental abnormalities, behavioral impairments, metabolic failure, reduced growth, and appetite loss [NRC, 2006; Rowe *et al*., 2002; U.S. EPA 2011f].

Humans are exposed to arsenic primarily by ingesting contaminated drinking water [WHO, 2001]. Humans are also exposed to arsenic by consuming contaminated fish. Of greatest concern is inorganic arsenic, which can cause cancer in humans. Several studies have shown that most arsenic in fish is organic and not harmful to humans. Inorganic arsenic typically accounts for 4 percent or less of the total arsenic that accumulates in fish.[9] The highest potential exposure is for individuals whose diet is high in fish and particularly shellfish [U.S. EPA, 1997b].

As discussed in Section 3.3.4, EPA has documented several damage cases where arsenic levels exceeded drinking water standards in ground water near combustion residual surface impoundments [U.S. EPA, 2014b through 2014e]. Arsenic contamination of ground water at the levels documented represents a potential human health threat, if either the aquifer is used as a drinking water source or the ground water contaminates a downstream drinking water source.

Cadmium

The speciation and toxicity of cadmium in water depends on the water's salinity, hardness, temperature, and organic content [WHO, 1992]. Cadmium tends to bioaccumulate readily in mollusks, soil invertebrates, and microorganisms. Due to its chemical similarity to calcium, it can also interfere with calcium uptake in aquatic organisms, which can cause sublethal effects in fish such as skeletal malformation. Divalent cadmium (Cd(II)) is the species most commonly found in an aquatic environment, but depending on the quality of the water, cadmium can also occur as cadmium carbonate, hydroxide, sulfite, sulfate, or chlorides.

EPA determined that cadmium is a probable human carcinogen. Studies found lung cancer in humans and rats exposed to cadmium via inhalation. In humans, chronic low-level exposure to cadmium from contaminated air, drinking water, or food can cause kidney failure. Chronic low-level exposure from contaminated drinking water or food can also lead to fragile bones. Exposure via inhalation at high levels can damage lungs and exposure via food and drinking water can irritate the stomach, leading to vomiting and diarrhea [ATSDR, 2012].

Thallium

Thallium typically exists as the monovalent or trivalent thallium ion [WHO, 1996]. It is soluble in most waters and is readily available to aquatic life. Thallium can bioaccumulate in fish and vegetation in fresh and marine waters, as well as marine invertebrates, which suggests that thallium may be a potential threat to higher order organisms in vulnerable ecosystems [U.S. EPA, 2011a]. Studies in humans and animals indicate that thallium compounds are readily absorbed through ingestion of food and water and maternal transfer [WHO, 1996].

In humans, elevated thallium concentrations can lead to neurological symptoms (*e.g.*, weakness, sleep disorders, muscular problems), alopecia (*i.e.*, loss of hair from the head and body), and gastrointestinal effects (*e.g.*, diarrhea and vomiting). Long-term exposures at levels above the MCL, 0.002 mg/L [U.S. EPA, 2009e], lead to changes in blood chemistry, damage to liver, kidney, and intestinal and testicular tissues, and hair loss. Thallium exposure can also cause reproductive and developmental damage [U.S. EPA, 2009a].

[9] Based on a 1996 literature review of toxicity and exposure concerns related to arsenic in seafood prepared for U.S. EPA Region 10, inorganic arsenic comprised higher than four percent total arsenic for three species (shark, sturgeon, and sucker). Inorganic arsenic for all other species accounted for less than 4 percent of the total arsenic [U.S. EPA, 1997b].

Lead

Neither metallic lead nor many of its common mineral forms are soluble in water, although it can be soluble in some acids or water with low pH; thus, lead is commonly present in precipitate form in water. Therefore, steam electric power plant wastewater may initially have high concentrations of lead, but later sampling of the wastewater can show decreased concentrations because the lead settles out quickly. Lead will accumulate in aquatic organisms, but depends on the species. Studies have shown lead to delay embryonic development, suppress reproduction, and inhibit growth rate among fish, crab, and several other aquatic organisms [U.S. EPA, 1984]. Human exposure to high concentrations of lead in drinking water can seriously damage the brain, kidneys, nervous system, and red blood cells, especially in children.

Boron

Boron is primarily found in the environment combined with oxygen in compounds called borates [ATSDR, 2010b]. Boron concentrations in North American waters are typically below 0.1 mg/L [WHO, 1998], although areas with natural boron-rich deposits may have ground water levels as high as 300 mg/L [ATSDR, 2010b]. The World Health Organization (WHO) suggests that the potential of adverse effects of boron on the aquatic ecosystem is low because the no-effect concentration (1 mg/L) is much greater than levels found in the ambient environment. Boron does not magnify through the food chain, but does accumulate in aquatic and terrestrial plants. While it is an essential micronutrient for higher plants, there is a small range between deficiency and toxicity in some plants. Studies of acute exposure in fish yielded toxicity values ranging from approximately 10 to 300 mg/L with rainbow trout and zebra fish being the most sensitive. Mallard duckling growth was impacted at dietary levels of 30 and 300 milligrams per kilogram (mg/kg), while survival was reduced at 1,000 mg/kg [WHO, 1998].

EPA has not set a numerical criterion under the National Recommended Water Quality Criteria (NRWQC) for aquatic life, but it has issued a narrative criterion of 0.75 mg/L for sensitive crops that receive long-term irrigation.

EPA has not set a NRWQC for human health. Very few human studies have examined health effects resulting from boron exposure through oral ingestion. However, one study documents nausea, vomiting, and diarrhea in an adult male who ingested 85 mg/kg of boron (30 g as boric acid) [ATSDR, 2010b]. In addition, animal experiments indicate that boron in the form of boric acid and borate affects reproductive and developmental processes at levels that are approximately 100 to 1,000 times greater than normal exposure levels, approximately 1.2 milligrams per day (mg/day) [WHO, 1998].

Manganese

In water, manganese tends to attach to particles or settle into the sediment [ATSDR, 2008b]. It occurs in both dissolved and suspended forms, depending on the water chemistry (*e.g.*, pH) [WHO, 2011]. Manganese can bioaccumulate in lower organisms, such as phytoplankton, algae, mollusks, and some fish, but not in higher organisms. Studies suggest that biomagnification up the food chain is not significant [ATSDR, 2008b].

Due to a high bioaccumulation factor and concentrations in mollusks, EPA established a criterion to protect consumers of marine mollusks—100 micrograms per liter (µg/L) for marine

waters [U.S. EPA, 1986]. Although high levels can be toxic to humans, manganese is an essential nutrient required to maintain health and is generally not considered to be toxic when ingested [WHO, 2011]. EPA did not set a primary MCL for manganese in drinking water; however, EPA did set secondary (nonenforceable) standards at 50 μg/L to minimize objectionable qualities in the drinking water that cause laundry stains and objectionable tastes in beverages [U.S. EPA, 2009e].

3.1.2 Nutrients

Nutrients (*e.g.*, phosphorus and nitrogen) are essential components for plants and animals to grow and develop; however, increased nutrient concentrations can upset the delicate balance of nutrient supply and demand required to maintain aquatic life in surface waters. For example, excess nutrients can cause low oxygen in surface waters (hypoxia) and harmful algal blooms. These are primarily problems for estuaries, such as the Chesapeake Bay, and coastal waters, such as the Gulf of Mexico. Nutrient concentrations present in steam electric power plant wastewater are primarily attributed to the fuel composition and air pollution controls in the combustion process.

Total nitrogen loadings from coal-fired power plants could potentially increase significantly in the future as air pollution limits become stricter and air pollution control use increases. While wastewater from an individual steam electric power plant can have a relatively low nitrogen concentration the total nitrogen loadings from a single plant can be significant due to high wastewater discharge flow rates. Total nutrient loadings from multiple power plants are especially a concern for waterbodies that are nutrient-impaired or in watersheds that contribute to downstream nutrient problems. High nutrient loadings to surface waters can affect the ecological stability of freshwater and saltwater aquatic systems. For example, excessive levels of nutrients can stimulate rapid growth of plants, algae, and cyanobacteria on or near the waterbody surface, which in turn can obstruct sunlight penetration, increase turbidity, and decrease dissolved oxygen levels [U.S. EPA, 2015a]. These aquatic changes can potentially kill bottom-dwelling aquatic plants. Cyanobacterial blooms can also produce toxic secondary metabolites, known as cyanotoxins, that can have negative impacts to humans and wildlife that consume water contaminated with cyanobacteria. The presence of high levels of cyanotoxins in recreational and drinking water may cause fever, headaches, abdominal pain, and other symptoms in humans. Severe human impacts include seizures, liver failure, respiratory arrest, and (rarely) death [U.S. EPA, 2012d].

3.1.3 TDS

TDS, a reflection of water's salinity level, is a measure of the amount of dissolved matter in water. TDS comprises primarily inorganic salts and dissolved metals, as well as a small amount of organic matter. Common inorganic salts found in TDS can include cations (positively charged ions), such as calcium, magnesium, potassium, and sodium, and anions (negatively charged ions) such as carbonates, nitrates, bicarbonates, chlorides, and sulfates. TDS concentrations in steam electric power plants wastestreams include contributions from dissolved metals, chlorides, and bromides. Dissolved metals and other TDS constituents are found in wastewater particularly at acidic pH levels when they exhibit high solubilities. The specific constituents in TDS in steam electric power plant wastewater cause the negative impacts.

Bromides

Bromide is the anion of bromine; it commonly exists as salts with potassium and other cations, which are usually very soluble in water. In water, bromide reacts to form hydrobromic acid (HBr) and hypobromous (HOBr), bromous ($HBrO_2$), and bromic ($HBrO_3$) oxyacids. Bromide is commonly found in nature, with levels ranging from trace amounts to 0.5 mg/L in fresh water and levels ranging from 65 to over 80 mg/L in seawater. The bromide ion has a low degree of toxicity, and animal testing suggests very low acute toxicity upon oral administration [WHO, 2009].

While bromide itself is not thought to be toxic at levels present in the environment, its reaction with other constituents in water may be cause for concern now and into the future. The bromide ion in water can form brominated disinfection by-products (DBPs) when drinking water plants use certain processes including chlorination and ozonation to disinfect the incoming source water. Bromide can react with the ozone, forming bromates, or with chlorine or chlorine-based disinfectants used at drinking water treatment plants, to form brominated and mixed chloro-bromo DBPs, such as trihalomethanes (THMs) or haloacetic acids (HAAs) [WHO, 2009]. EPA has set MCLs for the following DBPs in chlorinated water:

- 0.010 mg/L for bromate due to increased cancer risk from long-term exposure.
- 0.060 for HAAs due to increased cancer risk from long-term exposure HAAs include dichloroacetic acid, trichloroacetic acid, chloracetic acid, bromoacetic acid, and dibromoacetic acid.
- 0.080 mg/L for total trihalomethanes (TTHMs) due to increased cancer risk and liver, kidney, or central nervous system problems from long-term exposure [U.S. EPA, 2009e]. TTHMs include the brominated trihalomethanes (bromodichloromethane, bromoform, dibromochloromethane) and chloroform. MCL goals for the individual trihalomethanes include 0 (zero) for bromodichloromethane and bromoform.

Studies indicate that exposure to THMs and other DBPs from chlorinated water are associated with human bladder cancer [Villanueva *et al.*, 2004; Cantor *et al.*, 2010]. Bromine-substituted DBPs are generally thought to have higher risks of cancer and other adverse human health effects compared to DBPs containing chlorine instead of bromine [Cantor *et al.*, 2010]. EPA has determined that bromodichloromethane and bromoform are likely to be carcinogenic to humans by all exposure routes and there is suggestive evidence of dibromocloromethane carcinogencity. Excess cancer risk (based on increased risk to 1-in-a-million) occurs at concentrations above 0.001 mg/L for bromodichloromethane, 0.008 mg/L for bromoform, and 0.0008 mg/L for dibromochlormethane [U.S. EPA, 2005c].

DBP formation and the individual form of the DBP are influenced by factors such as bromide ion concentration, pH of the source water, the disinfectant dose (ozone or chlorine), reaction or contact time, and organic matter concentration and reactivity [Liang and Singer, 2003; U.S. EPA, 2005c]. Studies have shown that higher bromide levels in source waters shift the distribution of the TTHMs towards brominated species [Krasner *et al.*, 1989] and the types of HAAs from chlorinated to brominated and mixed chloro-bromo haloacetic acids [Heller-Grossman, 1993; Cowman and Singer, 1996].

Under the Safe Drinking Water Act (SDWA), drinking water treatment plants must reduce DBPs in their treated water and reduce exposure to customers. EPA conducted a nationwide survey that showed that bromide levels in source water above 400 µg/L corresponded with increased levels of DBPs in the treated water [Weinberg, 2002]. Due to increased bromide concentrations in surface water, drinking water treatment plants have found increased difficulty meeting regulatory limits on DBPs [U.S. EPA, 2012a; Handke, 2009; Fiske *et al.*, 2011; States *et al.*, 2013; Wilson *et al.*, 2013]. In general, drinking water produced using surface water had higher concentrations of the DBPs than drinking water produced using ground water [U.S. EPA, 2005c].

The city of Pittsburgh, in cooperation with the University of Pittsburgh, completed a multiyear study on the Allegheny River to determine the major sources of bromide discharges, including coal-fired power plants. Typically, bromide concentrations are very low in the river, but there are increased levels near industrial sites. The bromide concentration in the source water provided a linear correlation to bromination in the drinking water. At a concentration of 0.050 mg/L in the source water, 62 percent of the TTHMs were the three brominated trihalomethane species. At a concentration of 0.150 mg/L, 83 percent of the TTHMs were the three brominated trihalomethane species [States *et al.*, 2013].

The California Urban Water Agencies (CUWA) evaluated costs associated with increased bromide levels in the source water for baseline and potential future DBP controls. CUWA developed virtual water treatment plants (WTPs) to represent their different source water areas and treatment needs, with virtual WTP design capacities ranging from 40 to 800 million gallons per day. To achieve potential future standards on currently regulated pollutants, including DBPs, CUWA estimated costs for capital improvements and added annual operation and maintenance costs. On the low end, CUWA anticipated spending between \$46 million to \$923 million in capital improvements and \$1 million to \$59 million on annual operation and maintenance costs to each virtual WTP (costs vary based on the characteristics of the virtual WTP). On the high end, CUWA anticipated spending between \$98 million and almost \$2 billion in capital improvements and between \$2 million and \$127 million in annual operation and maintenance costs for each virtual WTP [CUWA, 2011].

Bromide is naturally present in coal at trace levels and becomes part of the flue gas air emissions following combustion at steam electric power plants. Combusting coal with higher levels of bromide is known to improve removal of mercury from air emissions at steam electric power plants that operate wet FGD scrubbers. Accordingly, steam electric power plant operators might add bromide-containing salts (*e.g.*, calcium bromide) during coal combustion to improve mercury removal efficiency. The bromide-containing salts convert the mercury Hg^0 form into the more water soluble Hg^{2+} form. Bromide is not typically removed from steam electric power plant wastewaters prior to discharge to surface waters. As discussed earlier, bromides in surface waters can react with organic matter in the surface water to form DBPs at drinking water treatment plants. A recent study identified four drinking water treatment plants that experienced increased levels of bromide in their source water, and corresponding increases in the formation of brominated DBPs, after upstream steam electric power plants installed wet FGD scrubbers [McTigue *et al.*, 2014]. Bromide loadings into surface waters from coal-fired steam electric power plants could potentially increase in the future as more plant operators add bromide to help control mercury emissions.

Chlorides

Studies have found that combustion residual leachate reaching ground water has caused chloride levels to exceed secondary MCLs [NRC, 2006]. Chlorides contribute to the high TDS levels typical of steam electric power plant wastewater, as do calcium and magnesium. Both chlorides and TDS levels affect the availability and toxicity of other steam electric power plant wastewater constituents, including metals. As TDS and chlorides levels fluctuate, so do the amounts of other metals that dissolve due to solubility characteristics.

EPA recommends the following for chlorides: criterion maximum concentration of 860 mg/L (acute effects) and criterion continuous concentration of 230 mg/L (chronic effects) [U.S. EPA, 2009d]. Exceeding these chlorides levels in wastewater discharges can be harmful to animals and plants in nonmarine surface waters and can disrupt ecosystem structure. It can also adversely affect biological wastewater treatment processes. Furthermore, excessively high chlorides concentrations in surface waters can impair their use as source waters for potable water supplies. If sodium is the predominant cation present, the water will have an unpleasant taste due to the corrosive action of chloride ions.

3.2 LOADINGS ASSOCIATED WITH STEAM ELECTRIC POWER PLANT WASTEWATER

As discussed above, the pollutants commonly found in steam electric power plant wastewater such as metals, nutrients, and TDS (including bromides and chlorides) can cause considerable harm to surface waters, aquatic life, wildlife, and human health. EPA estimated pollutant loadings for the steam electric power plant wastestreams evaluated and considered as part of the revision to the steam electric ELGs (*i.e.*, FGD wastewater, fly ash transport water, bottom ash transport water, and combustion residual leachate). The total pollutant loadings for the evaluated wastestreams are significant, with these discharges accounting for over one-third of the toxic pollutants reported to be discharged in industrial National Pollutant Discharge Elimination System (NPDES) permits [ERG, 2015a]. EPA estimated the amount of pollutants (*i.e.*, loadings) discharged by steam electric power plants throughout the United States for the evaluated wastestreams as almost 3 million toxic-weighted pound equivalents (TWPE) annually.[10] EPA uses TWFs as a way to better understand how treatment technologies and industry discharges compare to one another [U.S. EPA, 2012b]. Although EPA uses TWFs and the estimated TWPE as an indicator of a pollutant's relative potential to cause harm, EPA does not use TWPE to represent actual aquatic or human health impacts that may have occurred at specific locations due to these pollutant loadings. To assess

Pollutant Loadings: How Does the Steam Electric Power Generating Industry Compare?

EPA estimates that discharges from steam electric power plants alone contribute approximately one-third of the toxic weighted pound equivalent (TWPE) pollutant loadings to the environment among all industrial categories that report discharges under NPDES permits.

[10] To calculate the TWPE, EPA multiplies a mass loading of a pollutant in pounds per year (lb/yr) by a pollutant-specific weighting factor, called the toxic weighting factor (TWF), to derive a "toxic equivalent" loading (lb-equivalent/yr), or TWPE. TWFs account for differences in toxicity across pollutants and allow mass loadings of different pollutants to be compared on the basis of their toxic potential. EPA has developed TWFs for more than 1,000 pollutants based on aquatic life and human health toxicity data, as well as physical/chemical property data [U.S. EPA, 2012b].

impacts to aquatic life or human health, EPA uses the amount of pollutant loadings discharged to the surface water and the resulting concentrations in the surface waters.

When coupled with the types of impacts associated with the pollutants, the magnitude of the loadings raises concern about the risks that these discharges present to the aquatic environment and the surrounding ecosystem. This section presents the annual baseline[11] pollutant loadings associated with the evaluated wastestreams and compares steam electric discharges to those of other industries to provide perspective on the magnitude of the loadings and subsequent potential impact these wastestreams pose to the environment.

3.2.1 Annual Baseline Pollutant Loadings

In support of the final rule, EPA estimated the pollutant loadings discharged from steam electric power plants for the evaluated wastestreams, as described in Section 10 of the TDD.[12] Table 3-2 presents the baseline annual pollutant loadings discharged for select pollutants considered for analysis in the EA.[13] EPA presents these loadings in terms of pounds and TWPE and lists the TWF where applicable. The pollutants with the highest annual TWPE discharges are manganese, cadmium, boron, thallium, mercury, selenium, and arsenic. Although the total pounds discharged of arsenic, cadmium, mercury, and thallium are lower than other pollutants, their relative toxicity (as represented by the TWF) results in a large TWPE. Other pollutants, such as boron and manganese, are relatively low in toxicity but have a high TWPE due to the fairly high amount of these pollutants in steam electric power plant wastewater discharges. The high TWPE for selenium results from a combination of its quantity discharged in steam electric power plant wastewaters and its TWF.

Pollutant Loadings from Steam Electric Power Plants Evaluated Wastestreams

- 2,210,000,000 pounds of pollutants per year.
- 2,680,000 pounds of TWPE per year.

[11] The analyses presented in this report incorporate some adjustments to current conditions in the industry. See Section 1 for further details.

[12] Prior to finalizing the rulemaking, EPA revised the datasets used to calculate pollutant loadings for bottom ash transport water and fly ash transport water. The final industry loadings calculated using these revised datasets are presented in the TDD. The total industry loadings presented in Section 3.2 reflect the revised datasets. However, EPA did not rerun the EA models and other analyses to reflect the final loadings dataset. EA analyses used previously calculated version of the steam electric power plant pollutant loadings that were derived following the same methodology. The EA pollutant loadings are included in DCN SE05620. Pollutant-specific loadings and removals presented in this report are based on the previously calculated version. Appendix J presents the results of a sensitivity analysis that evaluated the potential for these loadings revisions to affect the EA analyses.

[13] EPA selected the pollutants listed in Table 3-2 (which represent a subset of all steam electric pollutants of concern) for analysis in the EA based on the following factors for each pollutant: presence of the pollutant in the evaluated wastestreams (see Table 2-1); documented elevated levels of the pollutant in surface waters or wildlife from exposure to steam electric power plant wastewater; and magnitude of the pollutant loadings to receiving waters.

Table 3-2. Annual Baseline Pollutant Discharges from Steam Electric Power Plants (Evaluated Wastestreams)

Pollutant [a]	TWF [b]	Annual Discharge, pounds (lbs) [c]	Annual TWPE, pound-equivalent (lb-eq) [c]
Metals and Toxic Bioaccumulative Pollutants			
Manganese	0.103	7,530,000	773,000
Cadmium	22.8	13,300	303,000
Boron	0.00834	31,300,000	261,000
Thallium	2.85	63,700	182,000
Mercury	110.0	1,490	164,000
Selenium	1.12	140,000	157,000
Arsenic	3.47	29,600	103,000
Aluminum	0.0647	1,410,000	91,500
Lead	2.24	19,700	44,100
Copper	0.623	31,200	19,500
Vanadium	0.280	66,000	18,500
Iron	0.00560	2,740,000	15,400
Nickel	0.109	120,000	13,100
Zinc	0.0469	174,000	8,160
Chromium VI	0.517	156	80.5
Nutrients			
Total Nitrogen [d]	Not applicable	16,900,000	Not applicable
Total Phosphorus	Not applicable	214,000	Not applicable
Other			
Chlorides	2.435×10^{-5}	930,000,000	22,600
Total dissolved solids			Not applicable
Total Pollutants [e]		2,210,000,000	2,680,000

Sources: Abt, 2008; ERG, 2015a; ERG, 2015b; ERG, 2015f; U.S. EPA, 2012c.

Note: Numbers are rounded to three significant figures.

a – The list of pollutants included in this table is only a subset of pollutants included in the loadings analysis (see Section 10 of the TDD).

b – TWFs for the following metals apply to all metal compounds: arsenic, chromium, copper, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc. EPA updated TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium for the steam electric ELGs pollutant loadings analysis.

c – These loadings reflect adjustments to current conditions in the industry. See Section 1 for further details. Data source for pollutant specific loadings is DCN SE05620.

d – Total nitrogen is the sum of total Kjeldahl nitrogen and nitrate/nitrite as N.

e – The totals represent the pollutant loadings in discharges of the evaluated wastestreams – specifically, FGD wastewater, fly ash transport wastewater, bottom ash transport wastewater, and combustion residual leachate (see Section 10 of the TDD). Loadings presented are based on the final loadings analysis presented in the TDD. The totals exclude loadings for pollutants not identified as POCs and for biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), total dissolved solids (TDS), and total suspended solids (TSS).

3.2.2 Comparison of Steam Electric Power Plant Loadings to Other Industries

The total TWPE discharges from the steam electric power generating industry are higher than the TWPEs estimated for many other industries. As part of the Preliminary 2010 Effluent Guidelines Program Plan published on October 30, 2009 (74 FR 68599), EPA identified 10 point source categories, out of 56, that represented the bulk of the estimated toxic wastewater discharges (as measured by TWPE) from existing industrial point source categories. EPA ranked each point source category by the amount of toxic pollutants in its discharges and identified the Steam Electric Power Generating Point Source Category (40 CFR 423) as the category with the highest TWPE. Table 3-3 presents the total TWPE estimated as part of the 2010 Effluent Guidelines Planning Process for the remaining nine point source categories with the highest TWPE [U.S. EPA, 2011d]. The TWPE estimated for the 2010 Effluent Guidelines Planning Process includes pollutant loadings estimated from discharge monitoring reports (DMRs) and Toxic Release Inventory (TRI) reporting. Therefore, the industry totals may include double-counting of certain chemical discharges (*i.e.*, a facility must report a chemical on both its DMR and its TRI reporting form).

Table 3-3. Pollutant Loadings for the Final 2010 Effluent Guidelines Planning Process: Top 10 Point Source Categories

40 CFR Part	Point Source Category	Total TWPE [a] (lb-eq/yr)
423	Steam Electric Power Generating	2,680000 [b]
430	Pulp, Paper, And Paperboard	1,030,000
419	Petroleum Refining	1,030,000
421	Nonferrous Metals Manufacturing	994,000
418	Fertilizer Manufacturing	826,000
414	Organic Chemicals, Plastics, And Synthetic Fibers	649,000
440	Ore Mining And Dressing	448,000
415	Inorganic Chemicals Manufacturing	299,000
444	Waste Combustors	254,000
410	Textile Mills	250,000

Source: U.S. EPA, 2011d.

a – Only TWPE totals for the steam electric power generating industry include updates to TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium. The TWPE for all other point source categories is estimated from DMRs and TRI reporting and may include double-counting of certain pollutant discharges (*i.e.*, a facility must report a pollutant on both its DMR and its TRI reporting form). Loadings are rounded to three significant figures.

b –EPA calculated the steam electric power generating industry (40 CFR 423) discharges for the final rule as total 2,680,000 TWPE annually (see Section 10 of the TDD). These loadings reflect adjustments to current conditions in the industry. See Section 1 for further details.

EPA estimated that the total baseline TWPE from steam electric power plant wastewater is almost three times the amount estimated for the pulp, paper, and paperboard industry, petroleum refining industry, and nonferrous metals manufacturing (second, third, and fourth highest ranking), and it is over five times the TWPE for four of the six other industries identified as the top TWPE dischargers in the Final 2010 Effluent Guidelines Program Plan [U.S. EPA,

2011d].[14] This suggests that the loadings from the subset of evaluated wastestreams represent a greater environmental concern within the context of all industrial dischargers across the United States.

3.2.3 Comparison of Steam Electric Power Plant Loadings to Publicly Owned Treatment Works

To provide additional perspective on the magnitude of the pollutant loadings from steam electric power plants, EPA compared loadings for the evaluated wastestreams to those of an average publicly owned treatment works (POTW). EPA selected POTWs for comparison because, for point sources, POTWs and steam electric power plants dwarf all other point source discharges in terms of total TWPE of metals discharged to waters in the United States [U.S. EPA, 2010c].[15] In addition, the more than 16,000 POTWs are located across the United States and provide a common metric to use for point source evaluations.

EPA calculated the average pollutant loadings discharged from a typical POTW using EPA's Effluent Guidelines Program Plan DMR database, DMRLoadsAnalysis2009_v02.mdb. EPA assumed that a typical POTW discharges wastewater at a rate of 3 to 5 million gallons per day (MGD)[16] based on the number of facilities by discharge flow rate reported in Metcalf and Eddy, 2003 [ERG, 2015a]. EPA developed queries in the DMRLoadsAnalysis2009_v02.mdb to do the following: 1) select POTWs that discharge between 3 and 5 MGD, and 2) calculate the average DMR loadings (in pounds and TWPE per year) for each pollutant [ERG, 2015a]. Table 3-4 compares the average steam electric pollutant loadings by wastestream[17] to the pollutant

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[14] Data sources for the other industry discharges include DMRs and TRI reports. EPA recognizes that the DMR and TRI data have limitations (*e.g.*, only a subset of facilities and a subset of pollutants might be included in the estimated loadings); however, these are the most readily available data sets that represent discharges across the United States.

[15] Based on metal loadings (total TWPE) calculated by EPA's DMR Pollutant Loading Tool, 2010 data, by Standard Industrial Classification (SIC) code. The top two industries are SIC 4952 – Sewerage Systems (*i.e.*, POTWs) and SIC 4911 – Electrical Services. EPA's DMR Pollutant Loading Tool is an online tool (http://cfpub.epa.gov/dmr/) that calculates pollutant loadings from permit and DMR data from EPA's Permit Compliance System (PCS) and Integrated Compliance Information System for the National Pollutant Discharge Elimination System (ICIS-NPDES). The tool also ranks dischargers, industries, and watersheds based on pollutant mass and toxicity, and presents "top 10" lists to help users determine which facilities and industries are producing these discharges and which watersheds are impacted. Facilities report pollutant discharge monitoring data in their DMR as mass-based quantities (*e.g.*, pounds per day) and/or concentrations (*e.g.*, mg/L). The DMR Pollutant Loading Tool allows users to gather annual loadings data. For this EA, EPA reviewed the 2010 loadings reported in DMRs.

The use of the DMR data has its limitations. Only pollutants included in the facility's NPDES permit are included in the PCS and ICIS-NPDES databases; therefore, if a facility does not have mercury limitations, mercury discharges from that facility will not be included in the total for industrial discharges. States (or other permitting authority) have some discretion as to which data they make available (or enter) to PCS and ICIS-NPDES. For example, permitting authorities enter DMR and permit information for facilities that are considered major dischargers. However, they do not necessarily enter DMR or permit information into PCS for minor dischargers or facilities covered by a general permit.

[16] For comparison, the average discharge flow rates for the evaluated wastestreams are 0.45 MGD for FGD wastewater; 3.5 MGD for fly ash transport water; 2.1 MGD for bottom ash transport water; and 0.08-0.09 MGD for leachate [see Section 6 of the TDD].

[17] EPA calculated the average pollutant loadings for each wastestream by dividing the total pollutant loadings for the wastestream by the number of steam electric power plants discharging the wastestream [ERG, 2015a].

loadings from an average POTW assumed to discharge 3 to 5 MGD. The results of the analysis demonstrate the following:

- Average FGD wastewater discharges contain over 200 times more boron and manganese, over 75 times more selenium, and approximately 20 times more cadmium and nickel than average POTW discharges.
- Average fly ash transport water discharges contain over 10 times more boron, cadmium and thallium and over five times more arsenic, nickel, and selenium than average POTW discharges.
- Average bottom ash transport water discharges contain 30 times more thallium; approximately 10 times more manganese and nickel; and five times more cadmium than average POTW discharges.
- Average combustion residual leachate wastewater discharges contain more boron, iron, manganese, and selenium than average POTW discharges.

Nutrient loadings (total nitrogen and total phosphorus) from the average steam electric wastestreams are generally lower than the nutrient loadings from an average POTW. Total nitrogen loadings from an average FGD wastestream are approximately equal to those of an average POTW. Nitrogen loadings from average fly ash and bottom ash transport waters are less than the total nitrogen discharges from an average POTW (approximately 20 percent). The amount of total phosphorus discharged by an average POTW is over 20 times higher than that in the average fly ash transport water, bottom ash transport water discharges, and FGD wastewater. EPA did not calculate nutrient loadings for combustion residual leachate.

Loadings of the Evaluated Wastestreams Compared to POTWs

- FGD wastewater discharges contain:
  - 200 times more manganese
  - 200 times more boron
  - 75 times more selenium
  - 20 times more nickel
  - 20 times more cadmium
- Bottom ash transport water discharges contain 30 times more thallium and 10 times more manganese and nickel.
- Fly ash transport water discharges contain five times more arsenic, nickel, and selenium and 10 times more boron, cadmium, and thallium.
- Combustion residual leachate contains over four times more boron and iron.

For chlorides, EPA found that average FGD wastewater discharges contain approximately six times greater chlorides loadings than an average POTW discharge. The average discharges of fly ash transport water, bottom ash transport water, and combustion residual leachate from a steam electric power plant contain less chlorides than a typical POTW discharge (less than 10 percent). EPA's DMR data did not include pollutant loadings for TDS from POTWs; therefore, EPA could not compare these pollutant loadings between steam electric and POTW discharges.

Table 3-4. Comparison of Average Pollutant Loadings in the Evaluated Wastestreams to an Average POTW

Pollutant	Average Plant FGD Wastewater Discharge [a,b]		Average Plant Fly Ash Transport Water Discharge [a,c]		Average Plant Bottom Ash Transport Water Discharge [a,d]		Average Plant Combustion Residual Leachate Discharge [a,e]		Average POTW Discharge [a,f]	
	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)
Aluminum	1,530	99.1	8,490	549	4,240	274	837	54.1	3,590	215
Arsenic	9.54	33.1	312	1,080	66.5	231	10.8	37.5	45.9	159
Boron	334,000	2,790	17,900	149	2,190	18.3	6,530	54.5	1,540	12.8
Cadmium	81.2	1,850	47.7	1,090	19.1	435	2.87	65.3	3.54	80.6
Chromium VI	(g)	(g)	2.62	1.35	0.136	0.070	(g)	(g)	17.7	9.02
Copper	17.9	11.1	263	164	89.0	55.5	2.16	1.34	154	95.3
Iron	1,150	6.42	5,140	28.8	7,610	42.6	10,400	58.4	2,530	14.2
Lead	5.71	12.8	152	340	63.4	142	(g)	(g)	48.5	109
Manganese	74,500	7,650	486	49.9	4,770	490	790	81.1	354	36.1
Mercury	5.50	605	7.85	864	3.19	351	0.298	32.8	3,180	350,000
Nickel	620	67.6	180	19.6	301	32.7	13.1	1.43	30.6	3.06
Selenium	1,410	1,580	134	150	32.4	36.3	31.2	35.0	18.5	20.7
Thallium	16.7	47.7	137	392	302	863	0.338	0.964	9.94	28.2
Vanadium	20.8	5.82	220	61.7	11.4	3.21	538	151	No data	No data
Zinc	983	46.1	734	34.4	247	11.6	59.1	2.77	453	18.1
Total Nitrogen	128,000	--	23,400	--	24,600	--	(g)	--	123,000	--
Total Phosphorus	457	--	864	--	715	--	(g)	--	17,800	--
Chlorides	10,200,000	248	83,500	2.03	96,700	2.35	120,000	2.93	1,610,000	39.3
TDS	40,400,000	--	1,760,000	--	2,560,000	--	1,020,000	--	No data	--

Note: Numbers are rounded to three significant figures.

a – TWPE presented in the table include updates to TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium.

b – Average loadings based on 88 plants assumed to discharge FGD wastewater under baseline conditions [ERG, 2015a].

c – Average loadings based on 50 plants assumed to discharge fly ash transport water under baseline conditions [ERG, 2015a].

d – Average loadings based on 183 plants assumed to discharge bottom ash transport water under baseline conditions [ERG, 2015a].

e – Average loadings based on 95 plants assumed to discharge combustion residual leachate under baseline conditions [ERG, 2015a].

f – Average loadings based on average loadings calculated for POTWs discharging 3 to 5 MGD of wastewater (see DCN SE01961).

g – EPA did not calculate loadings for this pollutant and wastestream. See the Costs and Loads Report (DCN SE05831).

To provide additional perspective on the magnitude of the loadings, EPA calculated the equivalent number of typical POTWs that would discharge loadings equal to the 202 steam electric power plants[18] included in the baseline loadings analysis. Table 3-5 presents total pollutant loadings for the evaluated wastestreams (for the 202 plants) and the number of typical POTWs that would discharge equivalent loadings. The results demonstrate that the magnitude of the total loadings from 202 steam electric power plants is equivalent to a significantly larger number of typical POTWs for many of the pollutants commonly known to cause environmental harm. For example, EPA estimated that the total loadings in discharges of the evaluated wastestreams from these 202 plants are equivalent to approximately 20,000 POTW discharges of boron and manganese; over 7,500 POTW discharges of selenium; over 6,000 POTW discharges of thallium; over 3,500 POTW discharges of cadmium and nickel; over 1,000 POTW discharges of iron; and over 500 POTW discharges of arsenic and chlorides. This suggests that, for the evaluated wastestreams, 202 steam electric power plants contribute substantial pollutant loadings to the environment.

Table 3-5. Estimated Number of POTW Equivalents for Total Pollutant Loadings from the Evaluated Wastestreams

Pollutant	Annual Discharge pounds (lbs)	Equivalent Number of Average POTWs [a]
Aluminum	1,410,000	394
Arsenic	29,600	646
Boron	31,300,000	20,300
Cadmium	13,300	3,760
Chromium VI	156	8.81
Copper	31,200	203
Iron	2,740,000	1,080
Lead	19,700	406
Manganese	7,530,000	21,300
Mercury	1,490	<1
Nickel	120,000	3,920
Selenium	140,000	7,560
Thallium	63,700	6,410
Vanadium	66,000	No values for comparison
Zinc	174,000	384
Total Nitrogen	16,900,000	138
Total Phosphorus	214,000	12.0
Chlorides	930,000,000	578
TDS	4,210,000,000	No values for comparison

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

a – Equivalent number of POTWs is estimated by dividing the total annual pollutant loadings from the 202 steam electric power plants by the average POTW loadings presented in Table 3-4 for a 4-MGD POTW.

[18] The count of 202 steam electric power plants includes seven indirect dischargers that discharge wastewater to a POTW and do not discharge any of the evaluated wastestreams directly to surface waters. EPA included these indirect dischargers to protect confidential business information.

3.3 ENVIRONMENTAL IMPACTS FROM STEAM ELECTRIC POWER PLANT WASTEWATER

EPA identified environmental impacts from EPA's assessment of damage cases and literature sources ("other documented site impacts") caused by steam electric power plant wastewater and combustion residuals. EPA found over 150 steam electric power plants causing environmental impacts to surface water and ground water environments following exposure to steam electric power plant wastewater. Impacts identified in the damage cases and other documented site impacts include lethal and sublethal impacts on fish, impacts on the diversity and size of populations in the ecosystem, and impacts on drinking water quality. While these impacted sites are often assumed to be anomalies, mounting evidence indicates that the characteristics contributing to the documented impact (*e.g.*, magnitude of the pollutant loadings, type of pollutant present, plant operations, and wastewater handling techniques) are common among steam electric power plant receiving water locations [Cherry *et al*., 2000; NRC, 2006; Rowe *et al*., 2002].

Section 3.3.1 presents a qualitative discussion of the lethal and sublethal ecological effects of pollutants in steam electric power plant wastewater. Section 3.3.2 summarizes documented instances where steam electric power plant wastewater discharges have caused fish advisories or exceeded MCLs presenting a potential human health concern. Section 3.3.3 and Section 3.3.4 summarize the damage cases and other documented site impacts to surface water and ground water, respectively. Section 3.3.5 discusses the potential for these environmental impacts to occur at other locations.

3.3.1 Ecological Impacts

Documented ecological impacts associated with exposure to steam electric power plant wastewater include acute effects (*e.g.*, fish kills) and chronic effects (*e.g.*, malformations, and metabolic, hormonal, and behavioral disorders) upon biota within the receiving water and surrounding environment. Effects have included reduced growth and reduced survival of aquatic organisms and changes to the local habitat [Carlson and Adriano, 1993; Rowe *et al*., 2002].

This section provides examples of the lethal and sublethal effects on organisms exposed to steam electric power plant wastewater pollutants (*e.g.*, arsenic, cadmium, chromium, copper, mercury, and selenium) in surface waters and sediment. Scientific studies reported in the literature included:

- Field studies in which organisms collected from known contaminated sites were compared to those collected from uncontaminated sites.
- Laboratory experiments in which organisms intentionally exposed to steam electric power plant wastewater were compared to those unexposed.

Many of the scientific studies documented in the literature focused on selenium as a key pollutant of environmental concern within steam electric power plant wastewater. However, due to the complex nature of the wastewater, many studies evaluated the environmental effects of metals in steam electric power plant wastewater in aggregate.

Lethal and Sublethal Effects of Selenium

Selenium can bioaccumulate to toxic levels in organisms inhabiting environments with low selenium concentrations. For example, Lemly conducted a field study that investigated the patterns of selenium biomagnification and toxicity in aquatic organisms inhabiting a cooling water reservoir that received effluent from a power plant's surface impoundment [Lemly, 1985a]. Throughout the study, selenium concentrations in the reservoir averaged 10 µg/L; however, Lemly reported that fish tissue concentrations reached levels ranging from 500 to 4,000 times the average reservoir water selenium concentration. The results of the study indicated that the extent of selenium bioaccumulation depended on the trophic level of the fish present in the reservoir. Lemly observed that the selenium accumulation increased as the trophic level increased, which potentially correlated with the observed elimination of multiple higher-tropic-level fish species. Therefore, these findings suggest that—even at low concentration within a surface water—selenium can accumulate and biomagnify to toxic levels in aquatic organisms and pose a lethal threat to fish at the top of the trophic structure [Lemly, 1985a]. Predicting the impacts of selenium in aquatic ecosystems can be particularly challenging, because impacts to the ecosystem cannot be determined solely on the selenium concentration in the receiving water as demonstrated in this study.

Selenium discharges also impact species diversity in receiving waters. In 1977, two years after the initial operation of the Belews Creek Steam Station in North Carolina, the fish community inhabiting the plant's cooling water reservoir (a lake) underwent rapid decline, and species diversity drastically altered [Lemly, 1985a]. Lemly observed that 17 of the 20 fish species originally present in the lake were eliminated after the power plant began operation, including all game species (temperate perch [*Percichthyidae*], true perch and pike perch [*Percidae*], and sunfish [*Centrarchidae*]). Lemly reported significant levels of selenium accumulation in the eliminated species and statistically unchanged levels of selenium accumulation in the surviving species, relative to levels before the power plant began operation. Only three species maintained reproducing populations in the reservoir: one native species (mosquitofish) and two introduced non-native species of minnows (fathead minnows and red shiners) [Lemly, 1985a].

A number of scientific studies express concern over selenium exposure within lakes and reservoirs where longer residence times allow for further bioaccumulation and a greater potential to reach lethal concentrations. This is demonstrated by a series of major fish kills that occurred in 1978 and 1979 at Martin Creek Lake (Texas) due to the elevated concentrations of selenium in the water and fish tissue [U.S. EPA, 2014b]. In particular, studies concluded that elevated selenium concentrations were likely the primary contributor to fish kills in lakes and reservoirs, decreasing population density and community diversity [Coughlan and Velte, 1989; Crutchfield, 2000b; Crutchfield and Ferguson, 2000a; Cumbie and Van Horn, 1978].

The sublethal effects of selenium vary widely and can impact growth, reproduction, and survival of susceptible organisms. Scientists have demonstrated that various fish and amphibian species are sensitive to elevated selenium concentrations such as those found in steam electric power plant wastewater. In addition to lethal effects described above, these fish and amphibian species have developed sublethal symptoms such as accumulation of selenium in tissue (histopathological effects) and in the blood (hematological effects), resulting in decreased

growth, changes in weight, abnormal morphology, and reduced hatching success [Coughlan and Velte, 1989; Lemly, 1993; Sager and Colfield, 1984; Sorensen, 1988; Sorensen and Bauer, 1984a; Sorensen *et al*., 1982, 1983, 1984b].

The literature indicates that the extent of selenium accumulation in fish tissue varies by species, and selenium accumulates most significantly in the liver and reproductive tissues in most species [Baumann and Gillespie, 1986; Sager and Colfield, 1984; Sorensen, 1988]. Other studies have reported accumulation in the skeletal muscle, kidneys, gills, and hearts of fish, resulting in pathological lesions, morphological changes, increased organ weight, and decreased growth [Coughlan and Velte, 1989; Lemly, 2002; Sorensen and Bauer, 1984b]. Aquatic organisms exposed to steam electric power plant wastewater have exhibited elevated selenium concentrations in organs such as kidneys, liver, and gonads, resulting in abnormalities that hinder growth and survival [Rowe *et al*., 2002].

In addition, selenium is highly teratogenic (*i.e.*, able to disturb the growth and development of an embryo or fetus) and readily transferable from mother to egg [Chapman *et al.*, 2009; Janz *et al.*, 2010; Lemly, 1997b; Maier and Knight, 1994]. Selenium is known to bioaccumulate in the reproductive organs of fish and amphibian species. In one study, ovarian selenium concentrations in bluegill fish were observed at levels 1,000 times greater than the surrounding surface water [Baumann and Gillespie, 1986]. Multiple studies have documented reproductive failure or diminished reproductive success in both fish and amphibians inhabiting ponds, lakes, and reservoirs contaminated with selenium from steam electric power plant wastewater discharges [Baumann and Gillespie, 1986; Crutchfield, 2000b; Cumbie and Van Horn, 1978; Gillepsie *et al*., 1986; Hopkins *et al*., 2002; Nagle *et al*., 2001]. For example, Hopkins *et al*. [2006] observed reduced hatching success, abnormal swimming, and abnormalities in the face and skull in the offspring of selenium-contaminated female toads. Field and captive feeding studies also show reproductive impairment (reduced hatchability of eggs) among waterfowl exposed to elevated levels of selenium [Adams *et al.*, 2003; Ohlendorf, 2003 and 2007; Beckon *et al*., 2008; U.S. DOI, 1998; Smith *et al*., 1998].

Histopathological effects (*i.e.*, observable changes in tissue), increased metabolic rate, and decreased growth rates are effects typically caused by contamination from steam electric power plant wastewater. Water and fish samples collected before and after the discharge of power plant wastewater from the surface impoundment to the Texas Utilities Martin Creek Lake found that selenium concentrations were significantly elevated in the reservoir and in fish livers, kidneys, and gonads. In 1984, Garrett and Inman reported that elevated selenium concentrations persisted in the livers and kidneys of several species of fish for up to 3 years after the power plant wastewater discharges ceased. Additionally, a 1988 study by Sorensen found that red ear sunfish native to the reservoir exhibited ovary abnormalities related to elevated selenium concentrations up to 8 years following an 8-month exposure to power plant wastewater discharges. Although the surface impoundment discharge was short-lived, many of the histopathological effects persisted for years after the discharge had ceased [Rowe *et al*., 2002].

These sublethal effects of selenium, while not directly resulting in the mortality of exposed aquatic wildlife, can ultimately cause the types of population-level impacts described under lethal impacts above. The available scientific evidence indicates that reproductive success—specifically, offspring mortality and severe development abnormalities that affect the

ability of fish to swim, feed, and successfully avoid predation—is the critical assessment endpoint when evaluating the potential for selenium exposure to result in population-level impacts to resident fish species.

For a summary of the impacts of selenium on surface water, refer to Table A-10 in Appendix A.

<u>*Lethal Effects of Other Pollutants*</u>

Scientific studies have confirmed that both acute and chronic exposure to pollutants in steam electric power plant wastewater can be lethal to a wide range of aquatic organisms. For example, Guthrie and Cherry [1976] found that shrimp darters and salamanders were highly sensitive to acute exposures of steam electric power plant wastewater and experienced nearly 100 percent mortality following a five-day exposure to power plant wastewater discharges. Invertebrates and fish also evaluated in the study were less sensitive to the acute exposure to power plant wastewater and reported lower rates of mortality [Guthrie and Cherry, 1976]. Chronic exposures to power plant wastewater are also of concern; however, studies show extreme differences in species sensitivity [Rowe *et al*., 2002]. For example, juvenile chubsuckers (a benthic fish) exposed for 45 days to sediments, water, and food contaminated with power plant wastewater experienced a 75 percent mortality rate [Hopkins *et al*., 2001]. In another study, bullfrogs exposed to sediment and water from a combustion residual surface impoundment for 34 days demonstrated an 87 percent mortality rate (which was 41 percent greater than the mortality rate of bullfrogs included in control group) [Rowe *et al*., 2002]. A third study reported no lethal effects for banded snakes exposed for 2 years to fish collected from combustion residual surface impoundments [Hopkins *et al*., 2002].

Other studies examined lethal effects of sediments contaminated with combustion residuals. For example, eggs and hatchlings of fish and reptiles raised in contaminated sediment reported higher mortality rates (16 to 94 percent) than eggs and hatchlings from control groups [Hopkins *et al*., 2000; Nagle *et al*., 2001; Roe *et al*., 2006; Rowe *et al*., 1998a, 1998b, 2001; Snodgrass *et al*., 2004]. Each of the studies observed elevated mortality rates in conjunction with higher concentrations of steam electric power plant wastewater pollutants (*e.g.*, arsenic, cadmium, chromium, copper, selenium) in the exposed sediment.

Three studies evaluated the lethal effects of specific pollutants in steam electric power plant wastewater on a variety of organisms (*i.e.*, insects, fish, and amphibians) and determined the median lethal concentration (LC_{50}) for each pollutant-organism combination. LC_{50} is the concentration expected to be lethal to 50 percent of a group of organisms exposed for a given time duration. Table 3-6 summarizes the results from the three experiments and Table 3-7 presents the LC_{50} concentrations reported in the studies. Overall, the LC_{50} studies report species-specific differences, particularly among species living downstream of fly ash surface impoundment discharges. The downstream species developed resistance to pollutants compared to those living in unpolluted ponds. Because the LC_{50} concentrations were much higher than actual aquatic concentrations, there was no evidence in these experiments of acute lethal effects, though long-term (1 to 3 months) lethal effects could not be ruled out [Benson and Birge, 1985; Birge, 1978; Specht *et al*., 1984].

Sublethal Effects of Other Pollutants

Although the majority of sublethal effects documented in the literature primarily focus on selenium concentrations in steam electric power plant wastewater, several studies discussed the sublethal effects of other pollutants, such as arsenic, cadmium, chromium, copper, and lead [Rowe *et al*., 2002]. Sublethal effects from exposure to pollutants other than selenium in power plant wastewater can include changes to morphology (*e.g.*, fin erosion, oral deformities), behavior (*e.g.*, swimming ability, ability to catch prey, ability to escape from predators), and metabolism that can negatively affect long-term survival. For example, a study of larval bullfrogs living in combustion residual surface impoundments found that more than 95 percent of individuals had abnormal oral structures, such as the absence of grazing teeth or entire rows of teeth, which altered feeding habits and subsequently reduced growth rates in the affected bullfrogs [Rowe *et al*., 1996]. In another study, tail malformations in larval bullfrogs attributed to power plant wastewater exposure caused abnormal swimming behavior, and the affected bullfrogs were preyed upon more frequently than bullfrogs from unpolluted sites [Raimondo *et al*., 1998].

Several studies have demonstrated increased metabolic rates and decreased growth rates in aquatic organisms exposed to steam electric power plant wastewater. Increased metabolism causes organisms to waste energy during normal metabolic processes, which can affect growth. In a 1998 study by Rowe, grass shrimp caged in a surface impoundment for eight months experienced a 51 percent increase in standard metabolic rate. Similarly, crayfish captured near the impoundment experienced increased metabolic rates and decreased growth rates—effects that were also observed in crayfish collected from unpolluted sites and exposed to contaminated sediments from the combustion residual surface impoundment [Rowe *et al*., 2002].

Table 3-6. Summary of Studies Evaluating Lethal Effects of Pollutants in Steam Electric Power Plant Wastewater

Citation	Studied Organism	Test Performed	Trace Elements Studied	Summary of Results
Birge, 1978	Eggs from goldfish, trout, and toads	7- to 28-day lethal effects	22 elements	Among the 22 elements tested, cadmium, chromium, mercury, nickel, lead, and silver were the most toxic to all three species, with most LC_{50} being 0.1 milligrams per liter (mg/L) or less.
Benson and Birge, 1985	Minnows (fish) living in fly ash-polluted ponds in Kentucky compared to those living in uncontaminated ponds	Acute (96-hour) toxicity	Cadmium Copper Zinc	The study found a higher tolerance to cadmium and copper in the exposed fish compared to the fish from unpolluted ponds. However, both exposed and unexposed populations exhibited similar tolerance to zinc. See Table 3-7 for LC_{50} values.
Specht *et al*., 1984	Insects (coleopterans, mayflies, and other insects) exposed to fly ash surface impoundment effluent from the Appalachian Power Plant in Giles County, Virginia, compared to those living in an uncontaminated pond	Acute (96-hour) toxicity	Cadmium Copper Zinc	The study observed a higher tolerance to pollutants in exposed insects compared to those living in unpolluted ponds. See Table 3-7 for LC_{50} values.

Table 3-7. Median Lethal Concentrations (LC_{50}) for Pollutants in Steam Electric Power Plant Wastewater

Pollutant	LC_{50}, mg/L						
	7- to 28-Day Exposure			96-Hour Exposure			
	Trout [Birge, 1978]	Goldfish [Birge, 1978]	Toad [Birge, 1978]	Exposed Minnows [Benson and Birge, 1985]	Control Minnows [Benson and Birge, 1985]	Mayflies [Specht *et al.*, 1984]	Other Insects [Specht *et al.*, 1984]
Aluminum	0.56	0.15	0.05				
Arsenic	0.54	0.49	0.04				
Cadmium	0.13	0.17	0.04	3.89 [a] 9.55 [b]	3.06 [a] 7.16 [b]	0.27	1.2-250
Chromium	0.18	0.66	0.03				
Cobalt	0.47	0.81	0.05				
Copper	0.09	5.2	0.04	0.36 [a] 0.41 [b]	0.21 [a] 0.39 [b]	0.18	0.03-8.3
Lead	0.18	1.66	0.04				
Mercury	0.005	0.12	0.001				
Nickel	0.05	2.14	0.05				
Selenium	4.18	8.78	0.09				
Silver	0.01	0.03	0.01				
Vanadium	0.16	4.6	0.25				
Zinc	1.06	2.54	0.01	6.14 [a] 5.96 [b]	6.09 [a] 7.45 [b]	18.44	18.2

Acronyms: mg/L – milligrams per liter.

Shaded cells indicate that the pollutant was not evaluated.

a – Nominal water hardness of 100 mg/L calcium carbonate ($CaCO_3$).

b – Nominal water hardness of 250 mg/L calcium carbonate ($CaCO_3$).

3.3.2 **Human Health Effects**

Numerous damage cases show exceedances of drinking water standards at ground water and drinking water wells due to leachate from nearby impoundments and landfills.

Exposure to pollutants can cause non-cancer effects in humans, including damage to the circulatory, respiratory, or digestive systems and neurological and developmental effects. Steam electric power plant wastewater includes toxic pollutants and known or suspected carcinogens (*e.g.*, arsenic and cadmium). In the literature review, EPA identified potential human impacts from consuming fish in contaminated waters and from ingesting drinking water contaminated by pollutants from combustion residuals.[19]

During the late 1970s, three power plant cooling water reservoirs in Texas received discharges from surface impoundments containing elevated selenium levels, resulting in a series of fish kills. The reservoirs included Brandy Branch Reservoir, located in Harrison County; Welsh Reservoir, located in Titus County; and Martin Creek Lake, located in Rusk County. Investigations at the reservoirs implicated elevated selenium levels in the fish tissue as the cause. In 1992, the Texas Department of Health issued a fish consumption advisory for the three reservoirs after determining that the level of selenium in fish could pose a potential health risk to humans, especially children 6 years or younger and pregnant women.

Ground water and drinking water supplies can be degraded by pollutants in steam electric power plant wastewater and combustion residual leachate [Cross, 1981]. Combustion residual leachate can migrate from the site in the ground water at concentrations that could contaminate public or private drinking water wells and surface waters, even years following disposal of combustion residuals [NRC, 2006], as exemplified in the following example. The Wisconsin Electric Power Company (WEPCO) plant in Port Washington, Wisconsin, had disposed of fly ash in a quarry for over 20 years (1943-1971) at a depth of 40 to 60 feet, with some of the disposed ash below the water table. The disposal site is located in an upland area where down-gradient ground water is used as a source of drinking water. The Wisconsin Department of Natural Resources was notified in January 1980 and November 1990 that elevated levels of sulfates, selenium, and boron were found in a private drinking water well located 250 feet down-gradient from the coal-fired power plant waste disposal site. The impacted private well was replaced with a deeper well to avoid further contamination [U.S. EPA, 2014c].

[19] In this EA, EPA evaluated the threats to human health and the environment associated with pollutants leaching into ground water from surface impoundments and landfills containing combustion residuals. If these leached pollutants do not constitute the discharge of a pollutant to surface waters, then they are not controlled under the steam electric ELGs. While the CCR rulemaking is the major controlling action for these pollutant releases to ground water, the ELGs could indirectly reduce impacts to ground water. These secondary improvements are discussed in Section 7.8.

As discussed in Section 3.3.4 and Appendix A, there have been documented exceedances of MCL drinking water standards at off-site ground water and drinking water wells. Exceedances of MCLs in the ground water indicate potential human health impacts if the pollutants enter private drinking water wells. Section 3.3.4 outlines three documented instances where combustion residual leachate contamination caused impacts to private drinking water wells.

Drinking water standards can also be exceeded in surface waters. For example, Duke Energy's Riverbend Plant discharges surface impoundment effluent into Mountain Island Lake, which supplies drinking water to 700,000 people. The county detected arsenic and zinc concentrations above state standards in an area near the surface impoundment discharge pipe [*Charlotte Observer*, 2010]. While most of the pollutants in the surface water would likely be reduced to safe levels during drinking water treatment, elevated levels of pollutants in source water can impact the effectiveness of drinking water treatment processes and the ability of drinking water treatment plants to meet MCLs. Section 3.4.6 presents further details on drinking water resources near steam electric power plants.

3.3.3 Damage Cases and Other Documented Surface Water Impacts

Changes in surface water chemistry due to contamination from steam electric power plant wastewater can negatively impact all levels of an ecosystem, including lower food chain organisms, which affect the ecosystem's food web; fish inhabiting the surface water; and wildlife and humans when they bathe in or drink the water. As described in earlier sections, pollutants in surface water can accumulate in aquatic organisms such as fish. When wildlife or humans ingest these aquatic organisms, they can be exposed to a higher dose of contamination than through direct exposure to the surface water. Documented surface water impacts associated with discharges of steam electric power plant wastewater include damage to fish populations (*i.e.*, physiological and morphological abnormalities and various behavioral, reproductive, and developmental effects), decreased diversity in insect populations, and decline of aquatic macroinvertebrate population. Impacts that affect humans include exceedances of NRWQC, fish consumption advisories, and designation of surface waters as impaired (limiting recreational activities).

Some wastewater surface impoundments are located in, or near, large river floodplains. Failure of the embankments of surface impoundments can release catastrophic amounts of pollutants into surrounding ecosystems.

EPA's damage case assessment found 26 proven damage case sites and 31 potential damage case sites with surface water impacts [U.S. EPA, 2014a through 2014e]. Including documented site impacts from the literature review, EPA identified impacts to surface waters at nearly 70 steam electric power plants following exposure to wastewater (more than 140 documented site impacts) [ERG, 2015m]. Some of the documented impact sites are the same locations identified by EPA as damage case sites. Table 3-8 highlights several damage case and other documented impact sites where

negative surface water impacts from steam electric power plant wastewater discharges have been studied. In most cases, negative impacts have been studied and documented in multiple articles and reports. Tables A-6 and A-7 in Appendix A summarize the damage cases from combustion residual surface impoundments and landfills, respectively.

Table 3-8. Summary of Select Sites with Documented Surface Water Impacts from Steam Electric Power Plant Wastewater

Site Name and Location	Number of Documents that Discuss Surface Water Impacts at the Site	EPA Damage Case Assessment	Summary of Surface Water Impacts
Belews Lake, NC	13	Proven damage case [U.S. EPA, 2014b]	In 1970, Duke Power Company constructed Belews Lake as a cooling water reservoir to support the Belews Creek Steam Station. Almost immediately after surface impoundment effluent began discharging into the lake, fish populations experienced morphological changes, reproductive failure, and eventually death. In 1985, the Belews Creek Steam Station converted to a dry-ash transport system, ending the surface impoundment discharges to the lake. However, even 11 years after the discharges ceased, reproductive abnormalities persisted in the fish populations. Due to selenium concentrations, 16 of the 20 populations originally present in the reservoir were entirely eliminated, including all primary sport fish [Lemly, 1997a; U.S. EPA, 2014b].
Brandy Branch Reservoir, TX	1	Proven damage case [U.S. EPA, 2014b]	Brandy Branch Reservoir serves as a cooling water reservoir for Pirkey Power Plant. From 1986 to 1989, the Texas Parks and Wildlife Department's) reported increases in the selenium concentrations of the fish inhabiting the receiving water. As a result, the Texas Department of Health issued a fish consumption advisory for the reservoir, because of the potential health impact due to the levels of selenium in fish. Since the fish kills in the 1980s, Southwestern Electric Power Company has worked cooperatively to monitor fish tissue selenium concentrations, which have decreased since the late 1980s [ATSDR, 1998a].
Euharlee Creek, GA	1	Proven damage case [U.S. EPA, 2014b]	On July 28, 2002, a sinkhole developed in the surface impoundment at the Georgia Power Company in Cartersville, GA. The sinkhole expanded to 4 acres, and an estimated 2.25 million gallons of ash/water mixture was released to a tributary of the Euharlee Creek. Approximately 80 tons of ash entered Euharlee Creek through a stormwater drainage pipe. This discharge deposited an ash blanket in the creek up to 8 inches deep over 1,850 square feet of the stream bottom. Sampling at the ash discharge site found that concentrations of certain metals (arsenic, cadmium, chromium, copper, lead, mercury, and nickel) exceeded EPA Region IV ecological sediment screening values (ESV'S) indicating a potential for adverse impacts to aquatic life. Sediment concentrations of arsenic measured 14 ppm dry weight–over five times the toxic threshold. Biological sampling indicated that benthic organisms in the tributary and ash deposition zone of Euharlee Creek were either killed by contaminants or physically smothered. The resident fish community, which consisted of at least 25 species, was displaced due to the irritation of high turbidity in the ash plume as it moved through during the spill. One month after the spill, concentrations of selenium and cadmium were elevated in crayfish, clams, mollusks, and insects at a Euharlee Creek site downstream from the ash deposit.

Table 3-8. Summary of Select Sites with Documented Surface Water Impacts from Steam Electric Power Plant Wastewater

Site Name and Location	Number of Documents that Discuss Surface Water Impacts at the Site	EPA Damage Case Assessment	Summary of Surface Water Impacts
Gibson Lake, IN	4	Proven damage case [U.S. EPA, 2014b]	Gibson Lake is a man-made, shallow impoundment that receives surface impoundment effluent from Gibson Generating Station. Starting in 1986, least terns, an endangered species of migratory birds, began using the dike in Gibson Lake as a nesting ground for breeding. To protect the birds from potential toxic exposure, the plant began a cooperative program with the Indiana Department of Natural Resources to protect the nesting birds by creating a nearby alternative habitat, known as Cane Ridge Wildlife Management Area (WMA), which received water pumped from Gibson Lake. In April 2007, Duke Energy closed access to the lake for recreational fishing due to elevated selenium levels. A year later, the U.S. Fish and Wildlife Service (USFWS) became concerned about selenium levels in the water and fish in the Cane Ridge WMA. The USFWS stopped the flow of water from Gibson Lake into Cane Ridge, discouraged least terns from using the refuge, removed the contaminated fish, and plowed Cane Ridge to redistribute and bury the selenium in the soil. Subsequently, the USFWS stopped the flow of water from Gibson Lake into Cane Ridge and piped water from Wabash River instead. Cane Ridge was restocked with fish to lure back migratory birds. As of 2010, fish populations in Gibson Lake still had selenium levels above the toxic threshold [U.S. EPA, 2014b].
Glen Lyn, VA	5	Proven damage case [U.S. EPA, 2014b]	Glen Lyn Plant discharged fly ash transport water from a surface impoundment into Adair Run, a tributary of the New River. A 1984 study reported that the local insect diversity and density remained essentially the same upstream (reference site) and downstream of the surface impoundment when the impoundment was not close to capacity. However, as the settling impoundment reached its capacity, the insect density and diversity declined downstream. After closure of the surface impoundment, it took up to 10 months for the insect populations to recover [Specht *et al*., 1984].
Hyco Lake, NC	8	Proven damage case [U.S. EPA, 2014b]	Hyco Lake is a large cooling water reservoir that received effluent from a power plant, including combustion residual leachate and fly ash transport water discharges containing high levels of selenium. In 1981, a large-scale fish kill occurred in the reservoir, prompting numerous scientific studies to examine the extent and cause of the environmental damage. Multiple studies detected selenium concentrations in the water and tissue of fish inhabiting the reservoir, while other trace elements were within normal concentration ranges. The selenium accumulated in the fish in the lake, impacting reproduction and causing declines in fish populations in the late 1970s and the 1980s. A fish consumption advisory was issued in 1988 for this lake due to selenium contamination.

Table 3-8. Summary of Select Sites with Documented Surface Water Impacts from Steam Electric Power Plant Wastewater

Site Name and Location	Number of Documents that Discuss Surface Water Impacts at the Site	EPA Damage Case Assessment	Summary of Surface Water Impacts
Martin Creek Lake, TX	8	Proven damage case [U.S. EPA, 2014b]	Martin Creek Lake is a cooling water reservoir that also receives steam electric power plant wastewater discharges. In 1978 and 1979, a series of major fish kills occurred due to the elevated concentrations of selenium in the water and fish tissue. Numerous studies conducted throughout the 1980s documented histopathological and reproductive damage in the fish populations inhabiting the lake. In addition, the studies determined that, even 8 years after discharge ceased, the overall health of the aquatic populations near the discharge site remained adversely affected by the selenium pollution. In 1992, a fish consumption advisory was issued for the lake due to discharges from the steam electric power plant [U.S. EPA, 2014b].
McCoy Branch, TN	3	Proven damage case [U.S. EPA, 2014b]	In 1986, coal ash slurry discharges from the Department of Energy's (DOE's) Chestnut Ridge Y-12 power plant into McCoy Branch were found to contain elevated concentrations of trace elements, which violated the Tennessee Water Quality Act. A 1992 report written by DOE documented bioaccumulation of contaminants in fish tissues, decreased diversity in benthic macroinvertebrate communities, and increased fish mortality and abnormalities at the site [U.S. DOE, 1992].
Mountain Island Lake, NC	5	Location not assessed	Duke Energy's Riverbend Plant discharges surface impoundment effluent into Mountain Island Lake, which supplies drinking water to 700,000 people. The county staff has detected arsenic and zinc concentrations above state standards in an area near the surface impoundment discharge pipe [*Charlotte Observer*, 2010]. The plant continues to extensively monitor metal concentrations in Mountain Island Lake surrounding the point of discharge [NCDENR, 2011].
North Carolina (Multiple Locations)	Not applicable, multiple sites	Location not assessed	A study of receiving waters (including lakes and rivers) for 10 steam electric power plants in North Carolina evaluated the environmental and ecological impacts that wastewater discharges have on surface waters. The study found that the receiving waters at the 10 plants contain high levels of contaminants as a result of wastewater discharges. From the data collected between 2010 and 2012, contaminant levels at multiple surface waters exceeded drinking water standards and/or NRWQC. For example, arsenic concentrations at two outfalls were as high as 45 µg/L and 92 µg/L, respectively (the drinking water MCL for arsenic is 10 µg/L). When compared to the upstream pollutant concentrations at the 10 North Carolina locations, data showed elevated levels of contaminants such as boron, chromium, selenium, bromine, arsenic, and thallium. Elevated pollutant concentrations were also found in lake sediments (arsenic and selenium) and pore water near lake bottoms (including manganese, arsenic, nickel, and bromine). The study found elevated levels of arsenic and selenium in fish tissues for two of the lakes (Hyco Lake and Mayo Lake). A report on fish in Mayo Lake found deformities consistent with ingestion of high selenium levels [Ruhl *et al.*, 2012].

Table 3-8. Summary of Select Sites with Documented Surface Water Impacts from Steam Electric Power Plant Wastewater

Site Name and Location	Number of Documents that Discuss Surface Water Impacts at the Site	EPA Damage Case Assessment	Summary of Surface Water Impacts
Rocky Run Creek, WI	5	Proven damage case [U.S. EPA, 2014b]	Rocky Run Creek, a tributary of the Wisconsin River, receives effluent from Columbia Power Station's surface impoundments. After the power station began operation in 1975, the aquatic macroinvertebrate populations declined in the area. Two studies conducted at this site concluded that population density decreased, not because of death due to coal ash toxicity, but because the aquatic macroinvertebrate populations avoided the area due to sublethal alterations in the creek. Studies found increased TDS and total suspended solids (TSS), as well as a number of heavy metals, downstream from the discharge. Some species of macroinvertebrates were totally eliminated 4 months after discharges began.
Savannah River Site, SC	23	Proven damage case [U.S. EPA, 2014b]	The Savannah River Site, which is owned by DOE, is divided into several areas, based on production, land use, and other related characteristics. The D-area, a site utilized by numerous ecologists to study the impacts of coal-fired power plant waste, houses a coal-fired power plant that discharges ash into a series of surface impoundments and a swamp that ultimately drains into the Savannah River. Numerous studies observed organisms within these habitats accumulated high concentrations of trace elements in their tissues and exhibited various physiological, behavioral, and developmental effects. Sediments, water, and biota in the disposal system have elevated concentrations of trace elements and heavy metals derived from bottom ash and fly ash deposited in the basins. The studies documented several impacts to amphibians, reptiles, and fish, including five species of fish that have been eliminated.
TVA's Kingston Fossil Plant, TN	6	Proven damage case [U.S. EPA, 2014b]	On December 22, 2008, the retaining wall of a surface impoundment at TVA's Kingston Fossil Plant broke and released billions of gallons of coal ash slurry into the Emory, Clinch, and Tennessee Rivers. Tennessee Department of Environment and Conservation found exceedances of the more stringent criteria for chronic exposure of fish and aquatic life at least once in January 2009 for several metals (*e.g.*, aluminum, cadmium, iron, and lead). Seven months after the spill, all fish collected had concentrations of selenium above a toxic threshold, and most were still contaminated at that level 14 months after the spill. Twenty-one months after the spill, a high percentage of fish were found with lesions, deformities, and infections, all symptoms of extreme stress. In addition, studies have shown elevated levels of arsenic and mercury in sediments near the ash spill, as well as selenium levels exceeding the MCL in three wells underneath the Kingston's coal ash disposal area, ash processing area, and gypsum disposal facility [U.S. EPA, 2014b].

Table 3-8. Summary of Select Sites with Documented Surface Water Impacts from Steam Electric Power Plant Wastewater

Site Name and Location	Number of Documents that Discuss Surface Water Impacts at the Site	EPA Damage Case Assessment	Summary of Surface Water Impacts
Welsh Reservoir, TX	2	Proven damage case [U.S. EPA, 2014b]	Welsh Reservoir serves as a cooling water reservoir for Welsh Power Plant. From 1986 to 1989, the Texas Park and Wildlife Department reported increases in the selenium concentrations of the fish inhabiting the receiving water. As a result, the Texas Department of Health (TDH) issued a fish consumption advisory for the reservoir because of the potential health impact due to the levels of selenium in fish. In 1998, TDH collected 20 fish for reevaluation and observed an average selenium concentration in the fish above the reported national averages. Therefore, the Agency for Toxic Substances and Disease Registry (ATSDR) concluded in a report that there was no clear indication of an overall change in selenium fish tissue concentrations over the 12 years [ATSDR, 1998b].

Sources: ATSDR, 1998a; ATSDR, 1998b; *Charlotte Observer*, 2010; ERG, 2013b; Lemly, 1997a; NCDENR, 2011; Ruhl *et al.*, 2012; Specht *et al*., 1984; U.S. DOE, 1992; U.S. EPA, 2014b.

3.3.4 Damage Cases and Other Documented Ground Water Impacts

Pollutants in combustion residuals can leach into ground water from surface impoundments and landfills at the site. Older surface impoundments and landfills are of particular concern because they were often built without liners and leachate collection systems. Liners are typically made of synthetic material, asphalt, clay, or a composite of materials (*e.g.*, synthetic and clay) and are designed to collect leachate and prevent ground water contamination. Combustion residuals held in unlined surface impoundments can enter the subsurface and contaminate ground water. Pollutants in unlined landfills, used for the dry disposal of combustion residuals, can also leach as precipitation flows through the residuals pile and dissolves pollutants; the combustion residual leachate can eventually migrate into ground water. New plants are increasingly installing liners in surface impoundments and landfills, but pollutants can also enter the ground water when liners fail or when a disposal site is situated such that natural ground water fluctuations come into contact with the disposed waste. Furthermore, state regulation on leachate collection systems and impermeable liners is not uniform [EPRI, 1997; 65 FR 32214-32237, 2000].

Numerous damage cases and other documented site impacts demonstrate the toxic effects of steam electric power plant wastewater contamination to ground water and the potential to impact off-site sources due to combustion residual leachate migrating from landfills and surface impoundments (often unlined). EPA's damage case assessment found 24 proven damage case sites and 110 potential damage case sites with ground water impacts [U.S. EPA, 2014a through 2014e]. EPA identified impacts to ground water quality caused by combustion residual leachate from 140 steam electric power plants (more than 130 documented site impacts) [ERG, 2015m]. Some of these documented site impacts are caused by ash contributions from multiple plants (*e.g.*, a landfill that stores ash from multiple plants). EPA identified some of the documented impact sites as also being damage case sites. The majority of the damage cases and documented site impacts reported ground water pollutant levels in on-site wells above regulatory levels; however, only a portion of the cases indicated off-site contamination. Documented impacts to off-site ground water resources may be lower due to long migration times within the subsurface until the combustion residual leachate reaches a known monitoring point [NRC, 2006]. Further, the limited number of studies documenting off-site contamination might reflect less extensive monitoring of off-site ground water wells for evidence of impacts from combustion residual leachate, which suggests off-site impacts may be underrepresented in the documented ground water impacts [Cherry, 2000].

In surface impoundments, combustion residuals are in constant contact with water, allowing toxic pollutants to leach into and eventually contaminate ground water. From an environmental impact perspective, combustion residual surface impoundments are generally considered less desirable than landfills for disposal because they provide constant saturated or nearly saturated conditions and a relatively large hydraulic driving force to move combustion residual leachate into the subsurface [Theis and Gardner, 1990]. Table A-4 in Appendix A summarizes documented ground water damage cases from combustion residual surface impoundments [U.S. EPA, 2014a through 2014e].

Although more desirable than surface impoundments, landfills pose their own ground water contamination risks. If the landfills are not properly lined, the pollutants in combustion residuals can leach into the soil during precipitation. In areas with acid rain, the precipitation's

low pH can accelerate the leaching of contaminants into ground water. In addition, heavy precipitation can not only accelerate leaching, but also carry pollutants in stormwater runoff, potentially contaminating ground water or surface water resources [Andersen and Madsen, 1983]. Table A-5 in Appendix A summarizes documented ground water damage cases from combustion residual landfills [MDNRE, 2010; U.S. EPA, 2014a through 2014e].

While many damage cases document elevated pollutant levels in ground water wells, it is unclear how many of these are private drinking water wells (as opposed to monitoring wells). However, the fact that many sites reported MCL exceedances in ground water testing suggests that potential impacts to drinking water resources are a realistic concern. The following three damage cases are documented instances where uncollected combustion residual leachate contaminated ground water and resulted in impacts to private drinking water wells.

Constellation Ash Disposal at Waugh Chapel and Turner Pits – Anne Arundel County, Maryland

For over a decade, Constellation Energy Group (Constellation) supplied fly ash for structural fill at the B.B.S.S. Inc. (BBSS) sand and gravel mines in Anne Arundel County, Maryland. Fly ash from Constellation's Brandon Shores and Wagner plants was used to reclaim portions of BBSS's Turner Pit starting in 1995 and the Waugh Chapel Pit starting in 2000. In the fall of 2006, Anne Arundel County Health Department officials documented concentrations of sulfate and metals (*i.e.*, antimony, beryllium, cadmium, manganese, and nickel) exceeding the state's screening criteria for potable aquifers in residential wells located downgradient from Waugh Chapel and Turner Pits [MDNR, 2007].

An independent study of the contamination confirmed that the elevated concentrations of sulfate and metals observed in the wells directly resulted from precipitation infiltrating the fly ash deposited in the BBSS sand and gravel mines [MDNR, 2007]. In October 2007, the Maryland Department of the Environment (MDE) fined Constellation and BBSS $1 million for the ground water contamination and required the companies to restore the local aquifer water quality [MDE, 2008]. In addition, Anne Arundel homeowners impacted by the contamination filed a class action lawsuit against Constellation and were awarded a $45 million settlement. The settlement required Constellation to pay the costs for converting 84 homes from well water to public water; cease future deliveries of new coal ash to the quarry; and to establish trust funds to compensate impacted property owners, enhance the neighborhood, and remediate and restore a former quarry site [Schultz, 2008].

Gibson Generating Station Plant – Gibson County, Indiana

The Gibson Generating Station Plant has six unlined surface impoundments (four surface impoundments and two settling/decant basins) and a landfill for combustion residuals. The landfill consists of a 94-acre older portion built in the late 1970s that is unlined and a 43-acre portion built in 2002 with a composite liner and leachate collection system. Additionally, the plant has a 400-acre landfill (South Landfill), permitted in 2005, which also has a composite liner and leachate collection system.

Samples from monitoring wells downgradient from the older landfill show high levels of arsenic, boron, iron, and manganese. Leaching from the landfill has contaminated 12 drinking water wells in the hamlet of East Mount Carmel, Indiana, with boron, manganese, iron, sulfate,

sodium, and TDS. Sampling performed by Duke Energy in 2007 and by the Natural Resources Defense Council in 2008 show drinking water contamination from boron, iron, and manganese in at least nine off-site private residential wells [U.S. EPA, 2014b].

Ground Water Violations Near North Carolina Power Plants With Surface Impoundments – North Carolina

The North Carolina Department of Environment and Natural Resources reported ground water contamination near combustion residual surface impoundments at all 14 of the state's coal-fired power plants. Duke Energy and Progress Energy each own seven of the plants and perform ground water monitoring as required by the state. Manganese and lead concentrations exceeded state ground water standards at all 14 locations and TDS and chromium concentrations exceeded state standards at seven locations. Boron levels at six plants exceeded state ground water standards, and some plants had elevated levels of arsenic, selenium, thallium, antimony, chlorides, and nickel. The state and plants have not identified the source of the contamination but noted that the exceedances occurred at newly located wells. Drilling the wells may have affected the concentration of naturally occurring elements such as lead and manganese [Ballard, 2012].[20]

3.3.5 Potential for Impacts to Occur in Other Locations

Key environmental characteristics that contributed to the impacts documented in Sections 3.3.3 and 3.3.4, such as chronic exposure to large pollutant loadings, plants discharging to waters with long residence times, and unlined surface impoundments or landfills, are common at steam electric power plants. This suggests that the impacts documented above indicate the greater potential threat that steam electric power plant wastewater discharges pose to the environment. Although substantial events such as fish kills are well documented, the extent to which more subtle damages, such as histopathological changes, morphological deformities, and damage to reproductive success, occur elsewhere is not known due to the limited extent of monitoring programs.

Some of the documented environmental impacts discussed above occurred following discharges of steam electric power plant wastewater under normal operations. Although the actual amounts of pollutant loadings discharged may vary among steam electric power plants, documented site impacts under normal operations do not indicate that the pollutant loadings associated with the impacts are unusual for steam electric power plants. This suggests that chronic exposure to typical steam electric power plant wastewater pollutant loadings can impact the environment at other sites not documented in the literature.

The residence time of steam electric power plant wastewater pollutants in surface water is a major factor in determining the impact to the environment and the length of the recovery time. Many documented impact sites are lentic waterbodies such as lakes (*i.e.*, still waters) where pollutants can reside for long periods of time. These types of surface waters are at particular risk to impacts from steam electric power plant wastewater discharges. Steam electric power plants that discharge to a pond, lake, or reservoir may experience similar environmental effects as those observed in the documented impacts from analogous aquatic systems [ERG, 2015j].

[20] EPA notes that the impacts reported at North Carolina plants have not been documented in a peer-reviewed literature source; however, the information shows that elevated levels of metal contamination can occur near ash ponds.

3.4 DISCHARGE TO SENSITIVE ENVIRONMENTS

The pollutant loadings, ecological impacts, and human health concerns discussed in Section 3.2 and Section 3.3 are also of concern due to the proximity of many steam electric power plants to sensitive environments where the characteristics of steam electric power plant wastewater may impair water quality (*e.g.*, 303(d)-listed waters and waters with fish advisories) or pose a threat to threatened and endangered species.[21] EPA identified the number of surface waters that receive discharges of the evaluated wastestreams and are located in close proximity to the following sensitive environments:

- Great Lakes watershed (Section 3.4.1).
- Chesapeake Bay watershed (Section 3.4.2).
- Impaired waters (Section 3.4.3).
- Fish consumption advisory waters (Section 3.4.4).
- Threatened and endangered species habitats (Section 3.4.5).
- Drinking water resources (Section 3.4.6).

Table 3-9 summarizes the number and percentage of immediate receiving waters located in sensitive environments.

Table 3-9. Number and Percentage of Immediate Receiving Waters Identified as Sensitive Environments

Sensitive Environment	Number (Percentage) of Immediate Receiving Waters Identified [a]
Great Lakes watershed	25 (11%)
Chesapeake Bay watershed	13 (6%)
Impaired water	111 (50%)
Surface water impaired for a subset of pollutants associated with the evaluated wastestreams [b]	59 (27%)
Fish consumption advisory water	140 (63%)
Surface water with a fish consumption advisory for a subset of pollutants associated with the evaluated wastestreams [c]	93 (42%)
Drinking water resource within 5 miles	199 (90%)

a – For the sensitive environment proximity analysis, EPA evaluated 222 immediate receiving waters that receive discharges of the evaluated wastestreams [ERG, 2015c; ERG, 2015d].

b – Table B-1 in Appendix B contains a complete list of the impairment categories identified in EPA’s 303(d)-listed waters and designates the subset of pollutants evaluated.

c – Table B-2 in Appendix B contains a complete list of the types of advisories identified under the sensitive environment proximity analysis, including pollutants that are not associated with the evaluated wastestreams.

3.4.1 Pollutant Loadings to the Great Lakes Watershed

The Great Lakes watershed includes hundreds of tributaries, thousands of smaller lakes, and extensive mineral deposits. The watershed provides a unique habitat that supports a wide range of flora and fauna, including over 200 globally rare plants and animals and more than 40 species found only in the Great Lakes watershed. Rare species include the white catspaw pearly mussel, the copper redhorse fish, and the Kirtland’s warbler. The watershed provides a habitat

[21] See the ERG memorandum “Proximity Analysis Methodology” (DCN SE04448) for a description of the methodology used to evaluate the proximity of steam electric power plants to sensitive environments.

and food web for an estimated 180 species of native fish, including small- and large-mouth bass, muskellunge, northern pike, lake herring, whitefish, walleye, and lake trout [Great Lakes Restoration Initiative, 2010].

The Great Lakes provide humans with transportation, power, and recreational opportunities including fishing and boating. Between the United States and Canada, the Great Lakes have more than 10,000 miles of coastline and 30,000 islands. The watershed is home to more than 30 million people. Recreational spending directly supports 107,000 jobs and nearly 250,000 jobs when secondary impacts are taken into consideration [Great Lakes Restoration Initiative, 2010].

Environmental impacts documented in the Great Lakes are associated with a range of stressors, including toxic and nutrient pollutants, invasive species, and habitat degradation. EPA and Environment Canada have focused their Great Lakes Binational Toxics Strategy on persistent toxic substances such as mercury [U.S. EPA and Environment Canada, 1997; Great Lakes Restoration Initiative, 2010]. Mercury is a concern in all of the Great Lakes due to its bioaccumulation in fish and wildlife and potential impacts on humans. For example, in a study of 65 hair samples from fish-eating and non-fish-eating women, average mercury concentrations in hair were significantly greater (*i.e.*, 128 to 443 percent higher concentration) for women who ate several meals of sport-caught fish from the Great Lakes. EPA and Environment Canada have documented a range of wildlife impacts from mercury in the Great Lakes such as an increase of physiological abnormalities in herring gulls [U.S. EPA and Environment Canada, 2009].

Annual Discharges to the Great Lakes Watershed from the Evaluated Wastestreams

- 1.15 million pounds of total nitrogen
- 9,570 pounds of thallium
- 8,730 pounds of zinc
- 5,020 pounds of selenium
- 2,170 pounds of arsenic
- 1,900 pounds of lead

As part of the EA, EPA wanted to determine the extent of impacts to the Great Lakes watershed that might be caused by discharges of the evaluated wastestreams. The primary source of mercury in the Great Lakes watershed is atmospheric deposition from sources around the Great Lakes watershed (*e.g.*, fuel combustion, incineration, and manufacturing) emitting approximately 70,000 pounds of mercury annually [Evers *et al.*, 2011]. When compared to atmospheric deposition, mercury contributions from point source discharges are less of a concern. Due to the bioaccumulative nature of mercury, EPA has placed strict controls (*e.g.*, mixing zones are not allowed in permits) to limit the total amount of mercury entering the Great Lakes watershed. Monitoring within the Great Lakes watershed has indicated a decrease in mercury point source discharges, primarily because of implemented control strategies. EPA identified 23 steam electric power plants discharging to the Great Lakes watershed with the majority discharging to Lake Michigan (11 plants) and Lake Erie (6 plants) [ERG, 2015a]. In the Lake Erie Management Plan, EPA identified steam electric discharges as contributing 57 percent of the mercury to Lake Erie from wastewater sources [U.S. EPA, 2008b].

The potential for bioaccumulative pollutant retention in still or slow-moving water, such as the Great Lakes, is a particular concern. Many pollutants in steam electric power plant wastewater can bioaccumulate in fish and then affect higher trophic levels and terrestrial environments. Table 3-10 presents total pollutant loadings for the evaluated wastestreams discharging to the Great Lakes watershed.

Table 3-10. Pollutant Loadings to the Great Lakes Watershed from the Evaluated Wastestreams

Pollutant	Annual Discharge to the Great Lakes Watershed (lbs)	Annual TWPE Discharge to the Great Lakes Watershed (lb-eq)
Arsenic	2,170	7,510
Boron	997,000	8,310
Cadmium	648	14,700
Chromium VI	0.548	0.283
Copper	2,550	1,590
Lead	1,900	4,250
Manganese	242,000	24,900
Mercury	82.8	9,110
Nickel	9,840	1,070
Selenium	5,020	5,630
Thallium	9,570	27,300
Zinc	8,730	409
Total Nitrogen	1,150,000	--
Total Phosphorus	23,100	--
Chlorides	31,900,000	778
Total Dissolved Solids	186,000,000	--

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

3.4.2 Pollutant Loadings to the Chesapeake Bay Watershed

The Chesapeake Bay is the largest estuary in the United States and is a complex ecosystem that provides habitats and food webs for diverse groups of animals and plants. A variety of fish either live in the Chesapeake Bay and its tributaries year-round or visit its waters as they migrate along the East Coast. The Chesapeake Bay Watershed covers 64,000 square miles, with 11,684 miles of shoreline, and includes areas in six states: Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia, plus Washington, DC. The watershed includes approximately 284,000 acres of tidal wetlands that provide critical habitats for fish, birds, crabs, and other species [Chesapeake Bay Program, 2015a and 2015b].

Annual Discharges to the Chesapeake Bay from the Evaluated Wastestreams

- 993,000 pounds of total nitrogen
- 6,560 pounds of selenium
- 5,830 pounds of zinc
- 5,280 pounds of thallium
  2,510 pounds of arsenic

The Chesapeake Bay and its tributaries provide recreational and commercial opportunities, with more than 100,000 streams, creeks, and rivers in the watershed. Fishers commonly catch striped bass and white perch and seafood production from the Bay totals approximately 500 million pounds per year [Chesapeake Bay Program, 2015].

The Chesapeake Bay was the first estuary in the nation to be selected for restoration as an integrated watershed and ecosystem. The watershed supports over 2,700 species of plants and animals, including 348 species of finfish and 173 species of shellfish. Other aquatic life includes algae, bay grasses, and other invertebrates. The watershed provides habitats for at least 29 species of waterfowl, with a population of nearly one million during the winter (representing

approximately one-third of the Atlantic Coast's migratory population) [Chesapeake Bay Program, 2015].

Most of the Chesapeake Bay and its tidal waters are listed as impaired for excess nitrogen, phosphorus, and sediment. These pollutants cause oxygen-consuming algae blooms and create "dead zones" where fish and shellfish cannot survive, block sunlight that is needed for underwater grasses, and smother aquatic life on the bottom of the Bay. To restore water quality in the Bay, EPA established Total Maximum Daily Load (TMDL) limits for the Chesapeake Bay watershed in December 2010. These limits are 186 million pounds of nitrogen, 12.5 million pounds of phosphorus, and 6.45 billion pounds of sediment each year, reducing the discharges to the watershed by 25 percent for nitrogen, 24 percent for phosphorus, and 20 percent for sediment. Pollutant loadings to the Chesapeake Bay watershed come from both point sources and nonpoint sources. Point sources include municipal wastewater treatment facilities, industrial discharge facilities (*e.g.*, steam electric power plants and concentrated animal feeding operations), NPDES permitted stormwater (municipal separate storm sewer systems (MS4) and construction and industrial sites), and other sources. Nonpoint sources include agricultural land runoff, atmospheric deposition, forest land runoff, nonregulated stormwater runoff, stream banks and tidal shorelines, tidal resuspension, the ocean, wildlife, and natural background [U.S. EPA, 2010d].

EPA identified nine steam electric power plants discharging to the Chesapeake Bay watershed and estimated that these plants discharge almost one million pounds of nitrogen and over 16,000 pounds of phosphorus to the Bay annually [ERG, 2015a]. Table 3-11 presents the baseline pollutant loadings for the evaluated wastestreams.

Table 3-11. Pollutant Loadings to the Chesapeake Bay Watershed from the Evaluated Wastestreams

Pollutant	Annual Discharge to the Chesapeake Bay Watershed (lbs)	Annual TWPE Discharge to the Chesapeake Bay Watershed (lb-eq)
Arsenic	2,510	8,720
Boron	1,390,000	11,600
Cadmium	513	11,700
Chromium VI	16.7	8.62
Copper	2,210	1,380
Lead	1,560	3,490
Manganese	148,000	15,200
Mercury	88.8	9,770
Nickel	5,280	575
Selenium	6,560	7,360
Thallium	5,280	15,100
Zinc	5,830	273
Total Nitrogen	993,000	--
Total Phosphorus	16,800	--
Chlorides	43,000,000	1,050
Total Dissolved Solids	186,000,000	--

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

3.4.3 Proximity to Impaired Waters

A surface water is classified as a 303(d) impaired water when pollutant concentrations exceed water quality standards and the surface water can no longer meet its designated uses (*e.g.*, drinking, recreation, and aquatic habitat). Based on that definition, half of the immediate receiving waters included in the EA are impaired waters.[22] EPA reviewed the identified 303(d) impairment categories and determined that approximately 27 percent of the immediate receiving waters are impaired for a pollutant associated with the evaluated wastestreams, as shown in Table 3-12. Figure 3-1, Figure 3-2, and Figure 3-3 illustrate the geographical location of plants that directly discharge wastewater to a water classified as impaired by high concentrations of mercury, metals (other than mercury), and nutrients.

Table 3-12. Number and Percentage of Immediate Receiving Waters Classified as Impaired for a Pollutant Associated with the Evaluated Wastestreams

Pollutant Causing Impairment	Number (Percentage) of Immediate Receiving Waters Identified [a]
Mercury	30 (14%)
Metals, other than mercury [b]	28 (13%)
Nutrients	19 (9%)
TDS, including chlorides	4 (2%)
Total for Any Pollutant [c]	**70 (32%)**

a – For the impaired waters proximity analysis, EPA evaluated 222 immediate receiving waters that receive discharges of the evaluated wastestreams [ERG, 2015c; ERG, 2015d].

b – The EPA impaired water database listed 28 immediate receiving waters as impaired based on the “metal, other than mercury” impairment category. Of those 28 immediate receiving waters, 13 receiving waters are also listed as impaired for one or more specific metals in the EA analysis (arsenic, cadmium, chromium, copper, lead, manganese, selenium, and zinc). One additional immediate receiving water is impaired for boron (but not included in the “metals, other than mercury” impairment category).

c – Total does not equal the sum of the immediate receiving waters listed in the table. Some immediate receiving waters are impaired for multiple pollutants.

[22] Table B-1 in Appendix B lists the impairment categories identified under the sensitive environments proximity analysis, including pollutants that are not associated with the evaluated wastestreams.

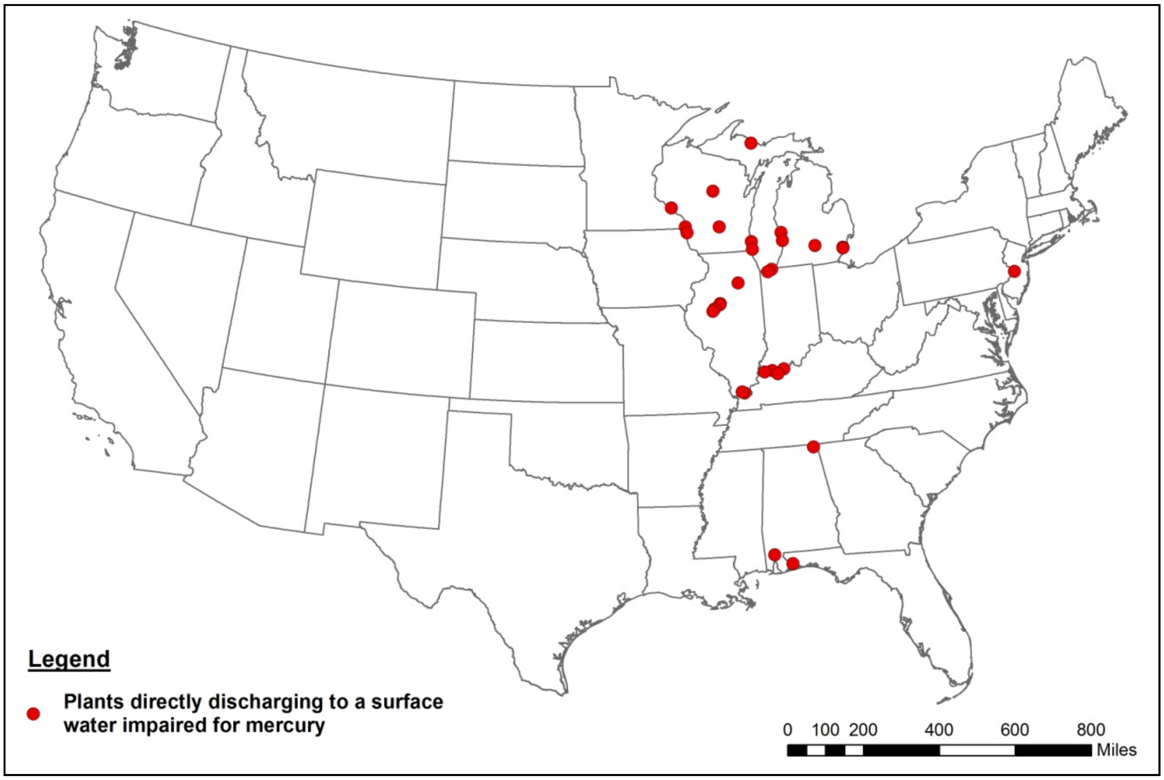


Figure 3-1. Location of Plants that Directly Discharge the Evaluated Wastestreams to a Surface Water Impaired due to Mercury

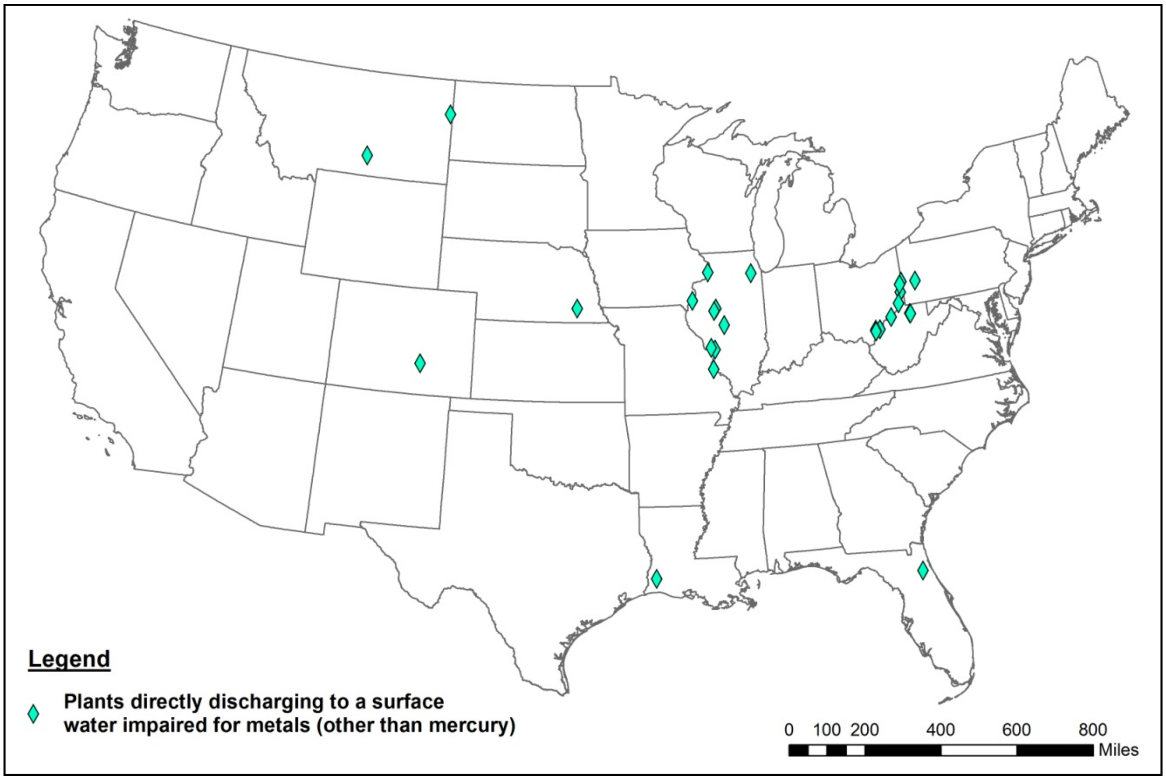


Figure 3-2. Location of Plants that Directly Discharge the Evaluated Wastestreams to a Surface Water Impaired due to Metals, Other than Mercury

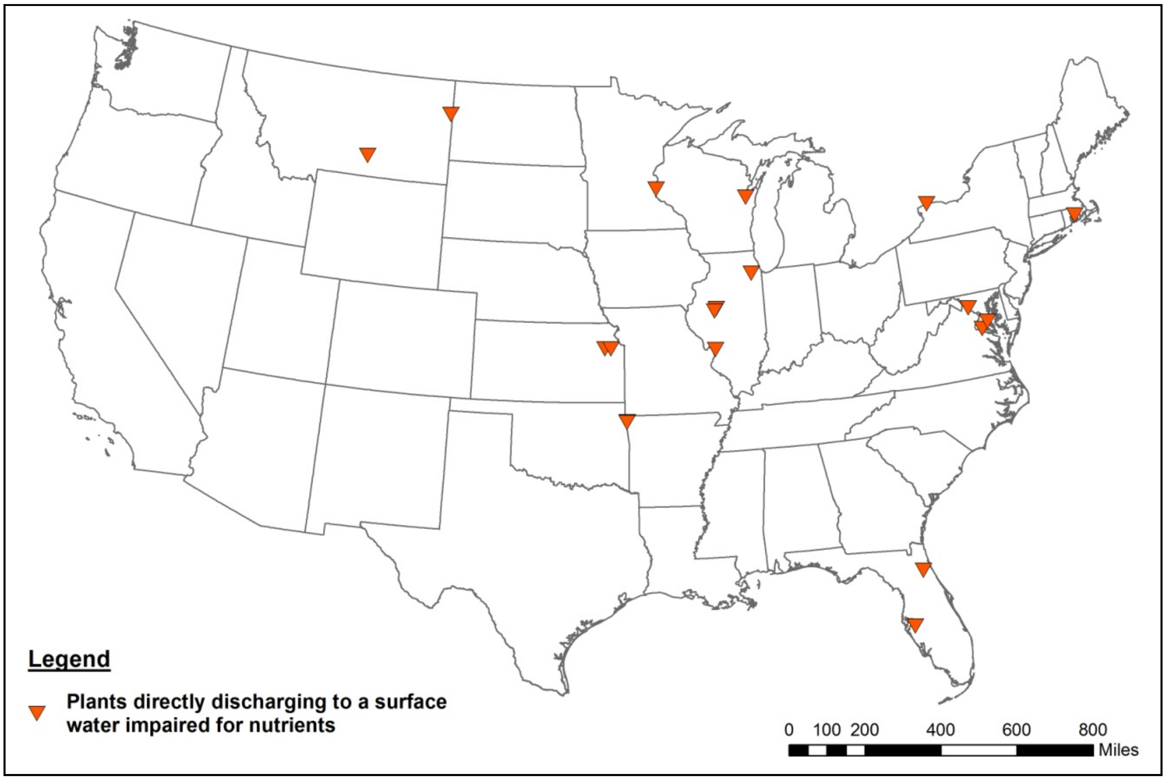


Figure 3-3. Location of Plants that Directly Discharge the Evaluated Wastestreams to a Surface Water Impaired due to Nutrients

3.4.4 Proximity to Fish Consumption Advisory Waters

States, territories, and authorized tribes issue fish consumption advisories when pollutant concentrations in fish tissue are considered unsafe for consumption [U.S. EPA, 2011e]. EPA determined that 140 of the immediate receiving waters included in the EA (63 percent) are under fish consumption advisories; 93 of the immediate receiving waters (42 percent) are under an advisory for a pollutant associated with the evaluated wastestreams.[23] All of these 93 immediate receiving waters are under a fish consumption advisory for mercury and one of the receiving waters is also under a fish consumption advisory for lead. EPA also reviewed fish consumption advisories for arsenic, cadmium, and selenium but did not identify any immediate receiving waters under advisories for these pollutants. Figure 3-4 illustrates the geographical location of plants that directly discharge steam electric power plant wastewater to surface waters with a fish consumption advisory for lead or mercury.

[23] Table B-2 in Appendix B lists the types of advisories identified under the sensitive environment proximity analysis, including pollutants that are not associated with the evaluated wastestreams.

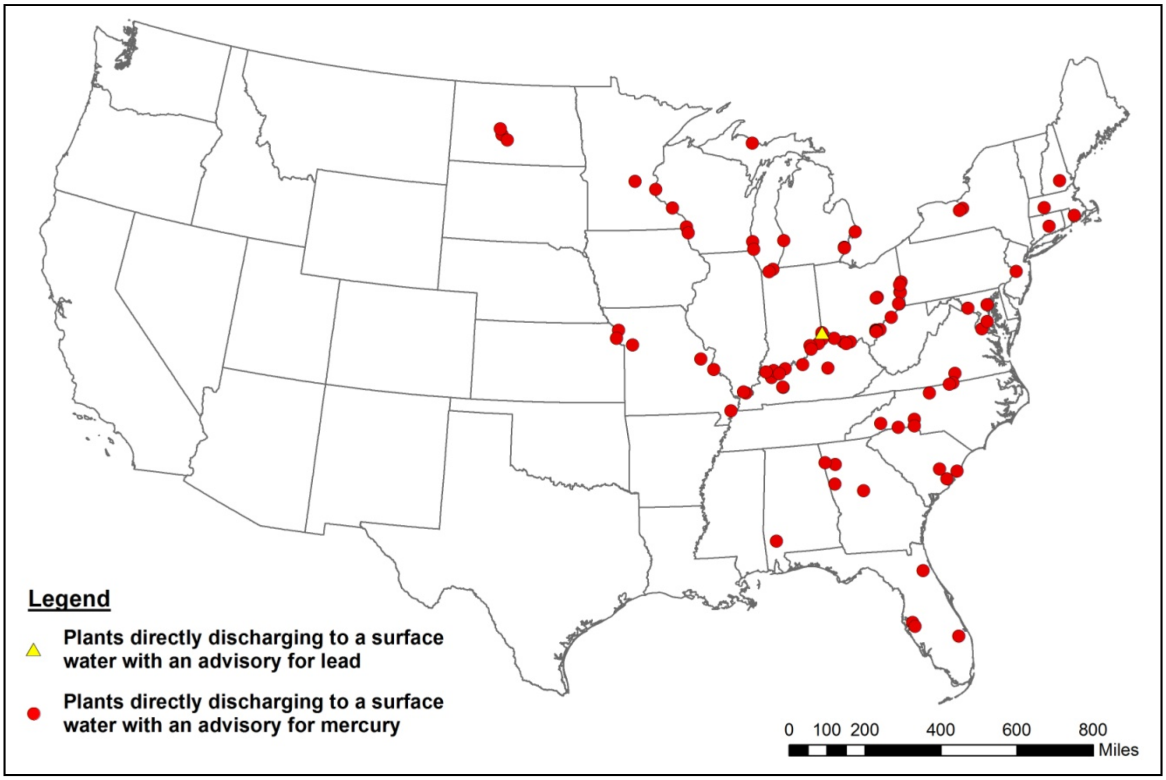


Figure 3-4. Location of Plants that Directly Discharge to a Surface Water with a Fish Consumption Advisory

3.4.5 Proximity to Threatened and Endangered Species Habitats

Under the Endangered Species Act (ESA), endangered species are those in danger of extinction throughout all or a significant portion of its range. Threatened species are those species that are likely to become endangered within the foreseeable future. A species may be listed solely on the basis of their biological status and threats to their existence. The USFWS considers five factors for listing: 1) damage to, or destruction of, a species' habitat; 2) overutilization of the species for commercial, recreational, scientific, or education purposes; 3) disease or predation; 4) inadequacy of existing protection; and 5) other natural or man-made factors that affect the continued existence of the species.

EPA evaluated the extent to which the estimated range and critical habitats of currently listed threatened and endangered species, or those in consideration for listing under the ESA (as of December 2014), overlap with surface waters that are potentially affected by the final rule. As described in the Benefits and Cost Analysis (EPA-821-R-15-005), these "affected areas" are receiving waters that do not meet water quality metrics recognized to cause harm in organisms under baseline conditions, but which do meet these metrics under the most stringent regulatory option EPA analyzed (Option E). EPA identified 138 threatened and endangered species whose habitats overlap with, or are located within, an "affected" surface water under baseline conditions.[24]

[24] The habitat locations evaluated for this analysis include waters downstream from steam electric power plant discharges and reflect changes in the industry as a result of the Clean Power Plan [Clean Air Act Section 111(d)].

In addition, EPA assessed the vulnerability of each species identified to changes in water quality and developed the following categories:

- High vulnerability: species living in aquatic habitats for several life history stages and/or species that obtain a majority of their food from aquatic sources.
- Moderate vulnerability: species living in aquatic habitats for one life history stage and/or species that obtain some of their food from aquatic sources.
- Low vulnerability: species whose habitats overlap bodies of water, but whose life history traits and food sources are terrestrial.

EPA classified 54 percent of the species (75 of 138 species) with habitats located within an “affected” surface water as highly vulnerable to changes in water quality. The habitats of these highly vulnerable species overlap a total of 145 affected stream reaches. For further details on the threatened and endangered species analysis and results, see the Benefits and Cost Analysis (EPA-821-R-15-005).

3.4.6 Proximity to Drinking Water Resources

EPA also evaluated the potential for steam electric power plants to pose a threat to public sources of drinking water. Although many of the pollutants (*e.g.*, selenium, mercury, arsenic, nitrates) in the evaluated wastestreams would likely be reduced to safe levels during drinking water treatment, these pollutants could potentially impact the effectiveness of the treatment processes, which could increase public drinking water treatment costs.[25] EPA evaluated the proximity of steam electric power plants to the following sensitive environments for drinking water resources:

- Drinking water intakes – drinking water sources that collect surface water through a public water system. Intakes are protected under the SDWA of 1974 and its 1986 and 1996 amendments, which require delegated states and tribes to perform routine testing to ensure that they meet state drinking water standards.
- Public wells – drinking water sources that collect ground water through a public water system. Public wells are protected under the SDWA, which requires delegated states and tribes to perform routine testing to ensure that they meet state drinking water standards.
- Sole-source aquifers – drinking water sources that supply at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no reasonably available alternative drinking water source(s) if the aquifer were to become contaminated.

Table 3-13 summarizes the number and percentages of plants included in the national-scale proximity analysis that are located within five miles of the evaluated drinking water resources. The table also presents the number of drinking water resources that are located within this five-mile buffer zone. For example, 67 steam electric power plants are located within 5 miles

[25] For more information on drinking water treatment processes used to reduce or eliminate metals commonly detected in the evaluated wastestreams from steam electric power plants, see the ERG memorandum “Drinking Water Treatment Technologies that Can Reduce Metal and Selenium Concentrations Associated with Discharges from Steam Electric Power Plants” (DCN SE02154).

of a drinking water system intake or drinking water reservoir. Within 5 miles of these 67 plants are 113 drinking water system intakes or reservoirs.

Table 3-13. Comparison of Number and Percentage of Steam Electric Power Plants Located within 5 Miles of a Drinking Water Resource

Type of Drinking Water Resource	Number of Drinking Water Resources within 5 Miles of a Steam Electric Power Plant	Number (Percentage) of Steam Electric Power Plants Located within 5 Miles of a Drinking Water Resource [a]
Intakes and reservoirs	113	67 (33%)
Public wells [b]	2,057	157 (81%)
Sole-source aquifers	8	7 (4%)

Sources: ERG, 2015c; ERG, 2015d

a – For the drinking water resource proximity analysis, EPA evaluated 222 immediate receiving waters that receive discharges of the evaluated wastestreams from 195 steam electric power plants.

b – Counts include two springs and 29 wellheads.

3.5 Long Environmental Recovery Times Associated with Pollutants in Steam Electric Power Plant Wastewater

Recovery of the environment from exposure to steam electric power plant wastewater is affected by continued cycling of contaminants within the ecosystem, bioaccumulation, and the potential alterations to ecological processes, such as population and community dynamics in the surrounding ecosystems. The ability of aquatic and adjacent terrestrial environments to recover from even short periods of exposure to steam electric power plant wastewater depends on the distance from discharge, the pollutant concentrations, pollutant residence time, and the time elapsed since exposure. In particular, accumulation of metals and other bioacummulative pollutants in sediments can slow recovery of aquatic systems following exposure to power plant wastewater due to the potential for resuspension in the water column and for benthic organisms to provide a pathway for exposure long after power plant wastewater discharges have ended. For example, Lemly [1985a, 1997a, 1999] documented that benthic pathways can continue to provide toxic doses of selenium to wildlife even 10 years after water column selenium concentrations are below levels of concern. Ruhl *et al.* [2012] documented elevated levels of power plant wastewater pollutants (including arsenic and selenium) in pore water, even in cases where the water column concentrations are not elevated. This study found that arsenic is retained in lake sediments and pore water through a cycle of adsorption and desorption, likely in response to seasonal changes in the lake water chemistry [Ruhl *et al.*, 2012].

Short Exposures to Steam Electric Power Plant Wastewater Can Equate to Lasting Ecological Effects

In Martin Creek Lake, ecological effects persisted for at least 8 years following 8 months of fly ash discharges into the lake.

Ash pond discharges to Belews Lake in North Carolina resulted in elevated levels of arsenic, selenium, and zinc in the water and impacts to fish populations. Even 11 years after discharges ceased, selenium levels in the sediments still posed a risk to wildlife that feed on benthic organisms.

As discussed in Section 3.1, many of the pollutants in steam electric power plant wastewater (*e.g.*, arsenic, mercury, selenium) readily bioaccumulate in exposed biota. The

bioaccumulation of these pollutants is of particular concern due to their impact on higher trophic levels, local terrestrial environments, and transient species, in addition to the aquatic organisms directly exposed to the wastewater. Aquatic systems with long residence times and potential contamination with bioaccumulative pollutants often experience persistent environmental effects following exposure to steam electric power plant wastewater.

Population decline attributed to exposure to steam electric power plant wastewater can alter the structure of aquatic communities and cause cascading effects within the food web that result in long-term impacts to ecosystem dynamics [Rowe *et al*., 2002]. Reductions in organism survival rates from abnormalities caused by exposure to power plant wastewater and alterations in interspecies relationships, such as declining abundance or quality of prey, can delay ecosystem recovery until key organisms within the food web return to levels prior to power plant wastewater exposure. In a 1980 study of a creek in Wisconsin, fungal decomposition of detritus was limited due to the effects of power plant wastewater. As a result, the benthic invertebrate population, which graze on detrital material, declined as did benthic fish that prey upon small invertebrates because of the reduced available resources [Magnuson *et al.*, 1980].

Studies have linked historical discharges of selenium from the Belews Creek Steam Station with persistent ecological impacts in the plant's cooling reservoir.

Belews Lake, a 1,500-hectare cooling reservoir constructed to support the Belews Creek Steam Station in Stokes County, North Carolina, is a well-documented site that highlights the effects that steam electric power plant wastewater can have on fish populations and the subsequent long recovery time. In 1970, Duke Energy began monitoring the fish populations in Belews Lake prior to any discharges of steam electric power plant wastewater. From 1974 to 1985, Duke Energy discharged surface impoundment effluent into Belews Lake. Almost immediately after these discharges began, rapid and dramatic changes in the fish populations were observed [Lemly, 1993]. By 1975, morphological abnormalities (*e.g.*, partial fin loss, head deformities, cataracts) were reported for all 19 fish species monitored in the lake. Within 2 years after surface impoundment effluent was released into the lake, several species stopped reproducing, leaving only four species by 1978 (*i.e.*, 4 years after discharges began). Water samples collected in the lake reported elevated levels of arsenic, selenium, and zinc. Large predatory fish were some of the first species to die out completely, due to the lethal and sublethal effects of exposure to surface impoundment effluent. Because a top predator was gone, some fish that exhibited developmental abnormalities were able to survive, despite their otherwise high susceptibility to predation [Lemly, 1993]. The study eventually correlated the observed fish abnormalities with high selenium whole-body concentrations, and identified the planktonic community as the key source of selenium to the impacted fish. In 1985, the Belews Creek Steam Station switched to disposing of the coal ash in a dry landfill and ended the surface impoundment discharges to the lake. In a 1997 study, Lemly determined that there was evidence that the lake was recovering; however, even 11 years after the discharges ceased, selenium levels in the sediments still posed a risk to wildlife that feed on benthic organisms. Lemly also

observed that despite the reduction in the selenium concentration in fish ovaries, reproductive abnormalities remained persistent, highlighting the long ecological recovery time observed in Belews Lake.

In addition to population density effects, the diversity of species in the communities in both field and experimental studies exposed to steam electric power plant wastewater has altered, which can further prolong ecosystem recovery [Benson and Birge, 1985; Guthrie and Cherry, 1976; Rowe *et al*., 2001; Specht *et al*., 1984]. In a study of fish populations in Martin Creek Lake following a short 8-month period in which the lake received fly ash surface impoundment discharges, both planktivorous (*i.e.*, diet primarily consists of plankton) and carnivorous (*i.e.*, diet primarily consists of meat) fish populations were severely reduced [Garrett and Inman, 1984]. Three years after the effluent release was halted, planktivorous fish populations remained extremely low, while carnivorous fish populations had nearly recovered. Carnivorous fish have a more diverse diet than planktivorous fish and therefore benefited from an increase in food availability as the aquatic system recovered; however, the size of carnivorous fish in the lake suggested that surviving adults continued to have reproductive impairments [Garrett and Inman, 1984]. Sorensen (1988) documented that ecological impacts in the lake remained evident even up to 8 years after the 8-month exposure to fly ash transport water discharges, with sunfish populations continuing to exhibit tissue damage to the liver, kidneys, gills, and ovaries and impaired overall reproductive health. Fish samples taken in 1996 and 1997 showed that the selenium concentration (2.3 parts per million (ppm) average for all sample fish) remained well above the national average range of between 0.1 and 1.5 ppm [ATSDR, 1998a].

SECTION 4
ASSESSMENT OF EXPOSURE PATHWAYS

An exposure pathway is defined as the route a pollutant takes from its source (*e.g.*, combustion residual surface impoundments) to its endpoint (*e.g.*, a surface water), and how receptors (*e.g.*, fish, wildlife, or people) can come into contact with it. Exposure pathways are typically described in terms of five components:

- Source of contamination (*e.g.*, steam electric power plant wastewater).
- Environmental pathway—the environmental medium or transport mechanism that moves the pollutant away from the source through the environment (*e.g.*, discharges to surface waters).
- Point of exposure—the place (*e.g.*, private drinking water well) where receptors (*e.g.*, people) come into contact with a pollutant from the source of contamination.
- Route of exposure—the way (*e.g.*, ingestion, skin contact) receptors come into contact with the pollutant.
- Receptor population—the aquatic life, wildlife, or people exposed to the pollutant.

Pollutants from steam electric power plant wastewater stored in surface impoundments can reach receptor populations (such as wildlife or people) through various exposure pathways.

The exposure pathway plays an important role in determining the potential effects of steam electric power plant wastewater on the environment. For example, the physical and chemical characteristics of receiving waters can affect the fate and transport of pollutants from combustion residual surface impoundments to the environment and ultimately impact how the pollutants interact with the biological community.

EPA identified four primary exposure pathways of concern for steam electric power plant wastewater entering the environment: 1) discharges entering surface waters, 2) uncollected combustion residual leachate infiltrating through soil to nearby surface water, 3) uncollected combustion residual leachate entering ground water, and 4) direct contact with steam electric power plant wastewater stored in surface impoundments. This section describes the factors that control the magnitude of impacts to water quality, wildlife, and human health associated with exposure to steam electric power plant discharges and presents an overview of EPA's environmental assessment (EA) of the steam electric power generating industry, in which EPA evaluated the national-scale effects of power plant wastewater pollutants on the environment. Table 4-1 presents the environmental pathways, routes of exposure, and environmental concerns identified during the literature review and the types of analyses conducted to determine the impacts under baseline conditions and regulatory options.

Table 4-1. Steam Electric Power Plant Wastewater Environmental Pathways and Routes of Exposure Evaluated in the EA

Environmental Pathway	Route of Exposure	Environmental Concern	Analysis to Determine Environmental Impact
Steam electric power plant wastewater discharges to surface waters	Direct contact with surface water	Toxic effects on aquatic organisms [a]	Water quality impacts analysis (quantitative) – see Section 4.1.2
	Ingestion of surface water	Degradation of surface water quality used as intake to drinking water plants	
	Direct contact with sediment	Toxic effects on benthic organisms	Wildlife impacts analysis (quantitative) – see Section 4.1.2
	Consumption of aquatic organisms	Bioaccumulation of contaminants and resulting toxic effects on wildlife	
		Toxic effects on humans consuming contaminated fish	Human health impacts analysis (quantitative) – see Section 4.1.2
Uncollected combustion residual leachate infiltration to nearby surface waters from combustion residual surface impoundment or landfill	Direct contact with surface water or sediment	Toxic effects on humans and aquatic wildlife	Ground water quality impacts analysis (qualitative) – see Section 4.2.2
Uncollected combustion residual leachate entering ground water from combustion residual surface impoundment or landfill	Ingestion of ground water	Changes in ground water quality	
		Contaminated private drinking water wells	
Combustion residual surface impoundment	Direct contact with or ingestion of surface water	Toxic effects on wildlife	Attractive nuisances analysis (qualitative) – see Section 4.3
		Bioaccumulation of contaminants in wildlife	

a – The term “toxic effects” refers to impacts upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains. These effects can include death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations, in receptors (*e.g.*, aquatic organisms, wildlife, humans) or their offspring.

4.1 DISCHARGE AND LEACHING TO SURFACE WATERS

Steam electric power plants commonly discharge wastewater directly to surface waters following storage and treatment (*e.g.*, particulate settling) in surface impoundments. In addition to effluent discharges, uncollected combustion residual leachate can migrate through the soil and into the surface water. Section 4.2 further discusses the impacts of uncollected combustion residual leachate.

4.1.1 Factors Controlling Environmental Impacts in Surface Waters

One of the primary factors controlling the environmental impact of steam electric power plant wastewater on surface waters is the residence time of the pollutants once they enter an

aquatic system. Residence times are often determined by the flow rate of the receiving water and type of ecosystem it supports. The potential for pollutant retention in lentic aquatic systems (*i.e.*, still or slow-moving water, such as lakes or ponds) and the creation of hot spots in lotic aquatic systems (*i.e.*, flowing water, such as streams and rivers) are of particular concern when bioaccumulative pollutants are present. Many of the pollutants in steam electric power plant wastewater discharges bioaccumulate, complicating estimates of potential impacts in surface waters because the pollutants can affect higher trophic levels, local terrestrial environments, and transient species, in addition to the aquatic organisms directly exposed to the wastewater.

Based on industry responses to EPA's 2010 *Questionnaire for the Steam Electric Power Generating Effluent Guideline* (Steam Electric Survey),[26] EPA determined that 18 percent of the 222 receiving waters included in the scope of the EA, all of which receive steam electric power plant wastewater discharges, are lentic systems such as lakes, ponds, reservoirs, and estuaries (Table 4-2). The majority of ecological studies on the impact of power plant wastewater in aquatic environments have focused on lentic systems [Rowe *et al*., 2002]. In lentic aquatic systems, the hydraulic residence time, or the amount of time it takes for the water in the aquatic system to be replaced by inflowing streams or precipitation is relatively long, allowing pollutants to build up over time and making these systems more vulnerable to impacts from power plant wastewater. In addition, aquatic organisms are limited in their ability to avoid areas of high pollutant concentrations and are restricted to the food supply available only within the waterbody.

Table 4-2. Receiving Water Types for Steam Electric Power Plants Evaluated in the EA

Receiving Water Type	Number (Percentage) of Immediate Receiving Waters [a]
River/Stream	183 (82%)
Lake/Pond/Reservoir	26 (12%)
Great Lakes	11 (5%)
Estuary and others (bay)	2 (1%)
Total Receiving Waters	**222 (100%)**

Source: ERG, 2015d.

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The immediate receiving water (IRW) model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters and loadings from 188 steam electric power plants.

Based on responses to EPA's Steam Electric Survey, EPA determined that 82 percent of aquatic environments that receive discharges of the evaluated wastestreams are lotic systems such as rivers and streams [ERG, 2015j]. Lotic systems dilute discharges more quickly than lentic systems. The moving water in lotic systems also provides a transport mechanism to disperse pollutants greater distances from the power plant, and enables aquatic organisms to move away from the areas contaminated by steam electric power plant discharges [Rowe *et al*.,

[26] Results presented in this report are based on plant responses to the Steam Electric Survey, which represent 2009 data. However, the analyses presented in this report incorporate some adjustments to current conditions in the industry. See Section 1 for further details.

2002]. Although power plant wastewater discharges into a lotic system can distribute pollutants across a greater spatial area, changes in flow velocity may result in the concentration of pollutants at a single location further downstream [Rowe *et al*., 2002]. For example, power plant wastewater discharged to a river may encounter areas of slower moving water downstream where pollutants would fall out of suspension and concentrate in a limited area. These pockets of higher pollutant concentrations, or hot spots, could be vulnerable to continued resuspension as stream velocities are affected by rainfall, resulting in the aquatic organisms being exposed to pollutants over much longer periods of time [Lemly, 1997a; Rowe *et al*., 2002].

4.1.2 Assessment of the Surface Water Exposure Pathway

EPA developed and executed models to quantify the water quality, wildlife, and human health impacts resulting from discharges of the evaluated wastestreams to surface waters. These models consist of the following: 1) a national-scale IRW model that evaluates the discharges from 186 steam electric power plants and focuses on impacts within the immediate surface water[27] where discharges occur, and 2) case study models that perform more sophisticated and extensive modeling of selected waterbodies that receive, or are downstream from, steam electric power plant wastewater discharges. Section 5 describes the IRW model and Section 8 describes the case study models. In addition, as part of the benefits and cost analysis, EPA also evaluated surface water concentrations downstream from steam electric discharges using EPA's Risk-Screening Environmental Indicators (RSEI) model; see the Benefits and Cost Analysis (EPA-821-R-15-005).

The remainder of this section discusses the scope of EPA's environmental assessment of the steam electric power generating industry in terms of evaluated pollutants, evaluated waterbody types, and evaluated environmental impacts.

Evaluated Pollutants

The EA quantitative analyses focused on the environmental impacts associated with discharges of toxic, bioaccumulative pollutants to surface waters. A key factor in determining the pollutants to include in the quantitative analyses was the potential for pollutant loadings to be diluted in the receiving waters following discharge. For example, EPA determined that the rivers and streams included in the IRW model had a median average annual flow of 2,808 cubic feet per second (cfs) and that 57 percent had an average annual flow greater than 1,000 cfs. Due to the potential for dilution, EPA focused the quantitative analyses on pollutants where the total mass loadings and not the concentration are critical factors in determining the potential for environmental impact. Section 5.1.2 lists the pollutants selected for quantitative analyses and how they were selected.

[27] The length of the immediate receiving water, as represented in the national-scale IRW model, ranges from between 1 to 5 miles from the steam electric power plant outfall. See the ERG memorandum "Water Quality Module: Plant and Receiving Water Characteristics" (DCN SE04513) for details on the immediate discharge zone and length of stream reach represented.

The EA quantitative analyses did not focus on water quality impacts associated with discharges of nutrients (total nitrogen and total phosphorus).[28] While discharges of large amounts of nutrients to surface waters can cause environmental problems (*e.g.*, eutrophication), EPA focused the EA quantitative analyses on 10 toxic pollutants that can bioaccumulate in fish and impact wildlife and human receptors via fish consumption. Additionally, nutrient-related impacts tend to be site-specific depending on environmental factors (*e.g.*, water-body temperature, the limiting nutrient in the system, algal species in the waterbody, and availability of oxygen in the water).

While the EA quantitative analyses did not address nutrient-related impacts, EPA did include nutrient loadings in the Benefits and Cost Analysis. EPA estimated total nitrogen and total phosphorus concentrations in receiving waters using dilution equations as input values to analyze benefits related to improvements in water quality. EPA used the SPARROW (SPAtially Referenced Regressions On Watershed attributes) model to provide baseline concentrations, as well as concentrations under each regulatory option. EPA used these concentrations to develop subindices for a water quality index (WQI), a value that translates water quality measurements, gathered for multiple parameters that represent various aspects of water quality, into a single numerical indicator. Total nitrogen and total phosphorous are only two of the subindices included in the WQI; the others are dissolved oxygen, biochemical oxygen demand, fecal coliform, total suspended solids (TSS), and heavy metals. EPA then used the WQI as a basis for calculating a willingness to pay for an increase in water quality as a result of the different regulatory options. See the Benefits and Cost Analysis for further details on the analysis and the results.

EPA identified total dissolved solids (TDS) and chlorides as the pollutants with the largest loadings under baseline conditions (see Table 3-2); however, EPA did not perform quantitative analyses of these pollutants for several reasons. TDS from the evaluated wastestreams consists largely of dissolved metals that are already captured in the analysis. Therefore, estimates of potential environmental impacts from TDS would double-count many of the environmental impacts and potential improvements assessed. Chlorides lack partition coefficient data (which are necessary for the water quality modeling performed in this EA) and have limited numeric threshold criteria data for comparison.

Evaluated Waterbody Types

In selecting the appropriate methodologies for the quantitative analyses, EPA considered the types of receiving waters commonly impacted by steam electric power plants and the pollutants typically found in the evaluated wastestreams. The IRW model and the selected case study models quantify the environmental risks within rivers/streams and lakes/ponds (including reservoirs), based on the determination that 94 percent of the final outfall receiving water designations fell within these two categories.

The EA quantitative analyses did not evaluate pollutant concentrations in the Great Lakes and estuarine systems, which represented 6 percent of all final outfall receiving waters. The

[28] EPA evaluated the nutrient impacts to the Great Lakes and Chesapeake Bay systems from a total mass loadings perspective, discussed in Section 3.4.

specific hydrodynamics and scale of the analysis required to appropriately model and quantify receiving water concentrations in the Great Lakes and estuarine systems are more complex than the IRW model.[29] In selecting the receiving waters to evaluate in the case study analyses, EPA focused primarily on rivers and streams based on the following: 1) the determination that 82 percent of the final outfall receiving water designations fell within this category, and 2) the relative simplicity of the hydrodynamics in river and stream case study models. This allowed EPA to develop and execute a larger set of case studies. EPA also developed one case study to represent the impacts of steam electric discharges to a lake. Refer to Section 8 for discussion of the receiving waters selected for case study analyses.

Evaluated Environmental Impacts

EPA focused the evaluation of environmental impacts on four key areas resulting from discharges of harmful pollutants to surface waters (rivers, streams, lakes, ponds, and reservoirs):

- Water Quality Impacts: Potential toxic effects to aquatic life based on changes in surface water quality—specifically, exceedances of the acute and chronic National Recommended Water Quality Criteria (NRWQC) for freshwater aquatic life.
- Wildlife Impacts: Potential toxic effects on benthic organisms based on changes in sediment quality within surface waters—specifically, exceedances of chemical stressor concentration limits (CSCL) for sediment biota.
- Wildlife Impacts: Bioaccumulaton of contaminants and potential toxic effects on wildlife from consuming contaminated aquatic organisms, specifically:
    - Risk of adverse reproductive impacts in fish and waterfowl that consume aquatic organisms with elevated levels of selenium (as determined by the ecological risk modeling methodology described in Section 5.2).
    - Potential risk of reduced reproduction rates in piscivorous wildlife, based on exceedances of no effect hazard concentration (NEHC) benchmarks.
- Human Health Impacts: Potential toxic effects to human health from consuming contaminated fish and water, specifically:
    - Exceedances of the human health NRWQC based on two standards: 1) standard for the consumption of water and organisms and 2) standard for the consumption of organisms.
    - Exceedances of drinking water maximum contaminant levels (MCLs). Although MCLs apply to drinking water produced by public water systems and not surface waters themselves, EPA identified immediate receiving waters that exceeded a MCL as an indication of the degradation of the overall water quality following exposure to the evaluated wastestreams.

[29] EPA evaluated the impacts to the Great Lakes and Chesapeake Bay systems from a total mass loadings perspective, discussed in Section 3.4. See the ERG memorandum "Site-Specific Estuary Dilution Analysis" (DCN SE02152) for details on EPA's initial screening analysis of the modeled receiving water concentrations in the Great Lakes and estuary systems compared to water quality benchmarks.

- Risk of cancer and non-cancer threats (*e.g.*, reproductive or neurological impacts) due to consuming fish caught from contaminated receiving waters.

4.2 LEACHING TO GROUND WATER

Combustion residual landfills and surface impoundments can impact local ground water through leaching.[30] Once in ground water, pollutants can migrate from the site and contaminate public or private drinking water wells and surface waters [NRC, 2006]. Contamination of drinking water wells is of particular concern because more than one-third of the U.S. population relies on ground water for drinking water. According to the U.S. Geological Survey (USGS), one in every five samples of ground water used as a source for drinking contains at least one contaminant at a level of concern for human health [USGS, 2015].

The fate of pollutants that leach from combustion residuals to ground water is controlled by many biological and geochemical (*e.g.*, adsorption, desorption, and precipitation reactions with aquifer materials) processes that can vary over large spatial and temporal scales [NRC, 2006]. This section describes the pollutant concentrations, chemical characteristics (*e.g.*, solubility, leachability, persistence, and mobility), and fate and transport processes that influence the potential environmental impact of uncollected combustion residual leachate.

4.2.1 Factors Controlling Environmental Impacts to Ground Water

Environmental impacts to ground water are determined by the pollutant concentrations in the combustion residual leachate and the rate of pollutant transport in the ground water. The pollutant concentrations in the combustion residual leachate depend on factors such as characteristics of the combustion residuals, site conditions (*e.g.*, rainfall amount and pH of the pore water in the surface impoundment or landfill), and combustion residual residence time in the surface impoundment or landfill.[31] The rate of pollutant transport in ground water depends on factors such as the biogeochemical characteristics of the subsurface (*e.g.*, soil pH and oxidation-reduction potentials), local rates of ground water recharge, and unsaturated and saturated ground water flow velocities.

Pollutant Concentrations in Combustion Residual Leachate

Combustion residual characteristics include the mineralogy of the waste (*e.g.*, lime, gypsum, iron, and aluminum oxide content) and pollutant solubility in the pore water. The mobility of pollutants may be altered due to changes in pH, carbon and chloride content, and interaction with other wastes from steam electric power plants [Thorneloe *et.al.*, 2010]. The waste mineralogy can vary based on the chemical composition in the fuel source (*e.g.*, the

[30] In this EA, EPA evaluated the threats to human health and the environment associated with pollutants leaching into ground water from surface impoundments and landfills containing combustion residuals. If these leached pollutants do not constitute the discharge of a pollutant to surface waters, then they are not controlled under the steam electric ELGs. While the Coal Combustion Residuals (CCR) rulemaking is the major controlling action for these pollutant releases to ground water, the ELGs could indirectly reduce impacts to ground water. These secondary improvements are discussed in Section 7.8.

[31] Leaching experiments indicate that the chemistry of leachates is based on both the chemical composition of the waste and other factors such as site conditions [Thorneloe *et al.,* 2010]. Thorneloe [2010] specifically looked at fly ash and bottom ash waste from coal-fired power plants.

specific coal seam and geographic location of the mine) and operational characteristics at the plant. Many laboratory investigations have examined the solubility characteristics of various pollutants associated with fly ash [Prasad *et al*., 1996; Thorneloe *et.al*., 2010]. The results of these investigations largely depend on multiple factors, and they tend to be more applicable qualitatively rather than quantitatively (*e.g.*, results from investigations can be used to determine the likelihood of a pollutant to dissolve in the combustion residual leachate, but not the amount). Concentrations of inorganic pollutants derived from calcium, sodium, magnesium, potassium, iron, sulfur, and carbon are relatively high in aqueous solution of fly ash because of their high total concentrations in the ash [Prasad *et al*., 1996].

The pH level of pore water in surface impoundments can strongly influence the concentration of pollutants in leachate from impoundments to ground water.

The pH of the pore water is a dominant factor in the leaching of pollutants from unlined surface impoundments and landfills. Because most pollutants in combustion residuals exhibit weak acidic or weak basic behavior in aqueous solution, the pore water pH strongly influences the concentrations of pollutants in the combustion residual leachate. Steam electric power plants generate combustion residuals in high-temperature processes, and many acids and acidic precursors (*e.g.*, carbon dioxide, hydrogen sulfide, hydrochloric acid) are volatilized prior to waste collection. Therefore, combustion residuals typically yield an alkaline reaction in water, but acidic reactions have also been observed [Theis and Gardner, 1990]. Acidic pore water allows pollutants from the combustion residuals to remain in solution, increasing their mobility and the potential for ground water contamination. The results of a study of three power plants in Turkey indicated that combustion residuals in the deeper layers of landfills and on the bottoms of the surface impoundments may continue to leach if the pH value drops in the surrounding environment [Baba and Kaya, 2004].[32]

Table 4-3 presents data collected by EPA's Steam Electric Survey regarding pollutant concentrations in the combustion residual leachate under acidic, neutral, and basic (or alkaline) conditions. Arsenic exceeded its MCL for more than 60 percent of the samples in both acidic and basic combustion residual leachate. Similarly, the majority of manganese samples exceeded its secondary MCL under all pH conditions, with 95 percent of the samples exceeding the MCL in

[32] This conclusion was based on a comparison of ash extraction procedures used. The study examined how the concentration of trace elements in the ash can vary based on the procedure used, comparing the EPA-developed EP (extraction procedure) and its replacement method, TCLP (toxicity characteristic leaching procedure), and the ASTM (American Society for Testing and Materials) Method D-3987. A comparison of the results revealed that the ASTM procedure indicated much lower dissolved metal concentrations than the EP and TCLP procedures. These results indicate that pH is an important parameter affecting the leaching rate of metals from ash deposits. The lower pH values in the EP and TCLP methods increase the leaching rate of inorganic constituents of fly ash and bottom ash [Fleming *et al*., 1996].

acidic conditions. Selenium had varying concentrations under all pH conditions, but exceeded its MCL more frequently under basic conditions. Overall, the results support the conclusion that pH levels influence the concentrations of pollutants in the combustion residual leachate.

Table 4-3. Exceedances of MCLs in Leachate Under Acidic, Neutral, and Basic Conditions

Pollutant	MCL (mg/L)	Total Number of Samples			Percentage of Total Samples Exceeding MCL		
		Acidic	Neutral	Basic	Acidic	Neutral	Basic
Arsenic	0.01	21	64	90	62%	30%	71%
Boron	7 [a]	21	64	91	14%	31%	31%
Cadmium	0.005	21	63	90	29%	3%	29%
Chromium	0.1	21	64	90	0%	0%	18%
Copper	1.3	21	64	91	0%	0%	0%
Lead	0.015	21	62	86	5%	0%	2%
Manganese	0.05 [b]	21	64	89	95%	81%	54%
Mercury	0.002	21	64	89	5%	16%	8%
Nickel	No MCL	21	64	87	NC	NC	NC
Selenium	0.05	21	64	90	14%	17%	31%
Thallium	0.002	21	62	86	52%	10%	14%
Zinc	5 [b]	21	63	86	0%	0%	0%

Source: ERG, 2015d.

Acronyms: mg/L (milligrams per liter); MCL (Maximum contaminant level); NC (not calculated; no MCL for comparison).

Note: Data are for untreated leachate collected in leachate collection systems at steam electric landfills and surface impoundments.

a – The drinking water equivalent level, used for noncarcinogenic endpoints, is listed rather than the MCL.

b – MCL is a secondary (nonenforceable) standard.

In addition to the pH of the pore water, amounts of precipitation can affect pollutant concentrations in the combustion residual leachate. Although landfills are dry disposal sites, rainfall and frozen precipitation infiltrate through the waste, dissolving pollutants that can then leach from the landfill. Landfills in drier climates generate less combustion residual leachate than landfills in wetter climates.

The last factor affecting pollutant concentrations in the combustion residual leachate is the combustion residual residence time in the surface impoundment or landfill. In a study of metals (calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, and zinc) leaching from fly ash and bottom ash, all pollutants decreased in concentration with time of leaching, except for calcium, which released at a constant rate [Kopsick and Angino, 1981]. The most commonly noted leachate release curve is an initial flush curve, where the highest concentrations of pollutants are released as the leachate initially forms, with rapidly decreasing concentrations over time. Therefore, active surface impoundments receiving fresh combustion residuals will produce a leachate with elevated concentrations of pollutants that have a greater potential to contaminate drinking water sources and surface waters. Most inactive surface impoundments where pollutants have initially already leached from the combustion residuals

should produce a leachate with decreasing concentrations of pollutants [Kopsick and Angino, 1981].

Thorneloe *et al*. [2010] studied the leaching behavior of coal combustion residuals in landfills, performing tests using a range of pH conditions and liquid-solid ratios expected during management via landfills or beneficial use. Combustion residual leachate concentrations for most pollutants were variable over a range of coal types, plant configurations, and combustion residual types (*i.e.*, fly ash or flue gas desulfurization (FGD) gypsum). The study showed significantly different leaching results (liquid-solid partitioning [equilibrium] as a function of pH) for similar combustion residual types and plants. The variability in pollutant leaching results was several orders of magnitude higher than the variability in the pollutant concentrations in the combustion residuals; this indicates that the pollutant concentrations alone cannot predict the leaching of metals, as noted above. Table 4-4 presents pollutant concentrations in combustion residual samples across a pH range of 5.4 to 12.4 and the range of pollutant concentrations in the combustion residual leachate. The table also includes indicator values for each pollutant: toxicity characteristic (TC) values for Resource Conservation and Recovery Act (RCRA) hazardous waste regulatory determination and drinking water MCLs for combustion residual leachate concentrations. As shown in the table, the maximum combustion residual leachate pollutant concentrations:

Most surface impoundments are unlined, allowing pollutants to infiltrate into ground water and eventually into surface waters.

- Exceed the TC values for RCRA hazardous waste determinations for arsenic, barium, chromium, and selenium (in fly ash).
- Exceed the TC values for RCRA hazardous waste determinations for selenium (in FGD gypsum).
- Exceed the MCLs for nine metals (in fly ash and FGD gypsum): antimony, arsenic, barium (fly ash only), boron, cadmium, chromium, molybdenum, selenium, and thallium.

The higher pollutant concentrations in the combustion residual leachate indicate greater mobility of the pollutant from the solid/slurry residual to the liquid phase. The concentration of the pollutants in the combustion residual leachate can be hundreds to thousands of times greater than the MCL.

Table 4-4. Range of Fly Ash and FGD Gypsum Total Content and Combustion Residual Leaching Test Results (Initial Screening Concentrations) for Trace Metals

	Range of Combustion Residual Content		Range of Leaching Test Results: Concentration in the Combustion Residual Leachate		Indicator Values	
Pollutant	**Fly Ash (mg/kg)**	**FGD Gypsum (mg/kg)**	**Fly Ash (µg/L)**	**FGD Gypsum (µg/L)**	**TC Value for Hazardous Waste Designation (µg/L)**	**Drinking Water MCL (µg/L)**
Antimony	3.0-14	0.14-8.2	<0.3-11,000	<0.3-330	--	6
Arsenic	17-510	0.95-10	0.32-18,000	0.32-1,200	5,000	10
Barium	50-7,000	2.4-67	50-670,000	30-560	100,000	2,000
Boron	NA	NA	210-270,000	12-270,000	--	7,000 [a]
Cadmium	0.3-1.8	0.11-0.61	<0.1-320	<0.2-240	1,000	5
Chromium	66-210	1.2-20	<0.3-7,300	<0.3-240	5,000	100
Mercury	0.1-1.5	0.01-3.1	<0.01-0.50	<0.01-0.66	200	2
Molybdenum	6.9-77	1.1-12	<0.5-130,000	0.36-1,900	--	200 [a]
Selenium	1.1-210	2.3-46	5.7-29,000	3.6-16,000	1,000	50
Thallium	0.72-13	0.24-2.3	<0.3-790	<0.3-1,100	--	2

Source: Thorneloe *et al*., 2010.

Acronyms: Acronyms: MCL (maximum contaminant level); mg/kg (milligrams per kilogram); TC (Toxicity Characteristics); µg/L (micrograms per liter); NA (Not Available).

a – The drinking water equivalent level, used for noncarcinogenic endpoints, is listed rather than the MCL.

Transporting Pollutants in the Ground Water

Predicting the movement of combustion residual pollutants in ground water can be challenging due to the wide range of biogeochemical characteristics between sites and within a given site. Pollutant transport times can vary, and combustion residual pollutants can take many years to reach local drinking water wells and surface waters [NRC, 2006]. For example, in the damage case at the Virginia Power Yorktown Power Station Chisman Creek Disposal Site in Yorktown, Virginia, fly ash had been disposed of in abandoned, unlined sand and gravel pits at the site for almost 20 years, from 1957 to 1974. However, ground water contamination was not discovered until 1980, when nearby shallow residential wells became contaminated with nickel and vanadium. Sampling also showed elevated levels of other heavy metals and toxic pollutants: arsenic, beryllium, chromium, copper, molybdenum, and selenium [U.S. EPA, 2014b].

Natural mechanisms, such as soil buffering capacity, attenuation of trace pollutants in certain soil types, amount of organic matter, and low soil permeability, can limit the transport of combustion residual pollutants in the subsurface environment. The mobility of pollutants in the subsurface strongly depends on soil-specific characteristics. Soil can have a buffering influence over the leachate by raising or lowering the pH. As noted previously, the solubility of most trace pollutants (the notable exceptions being arsenic and selenium) tends to decrease with increased pH (*i.e.*, alkaline conditions). In general, trace pollutants are less mobile in alkaline soils because the pollutants will precipitate and/or adsorb onto hydrous iron and aluminum oxides. Theis and Richter [1979] attempted to assess the factors influencing the attenuation of trace metals in

soil/ground water. Results show that the major solubility control for cadmium, nickel, and zinc is adsorption by iron and manganese oxides while chromium, copper, and lead are controlled by precipitation. In some cases, particles in leachate may seal a surface impoundment or landfill, reducing the amount of leachate entering the ground water. Simsiman *et al.* [1987] and Kopsick and Angino [1981] both reported evidence of some sealing and reduced permeability of combustion residual surface impoundments, reducing seepage.

4.2.2 Assessment of the Ground Water Exposure Pathway

The EA focused on the discharges of toxic, bioaccumulative pollutants to surface waters from the evaluated wastestreams. While Section 3.3 provides qualitative discussion of ground water impacts based on a review of damage cases and other documented site impacts, the EA did not quantify the environmental and human health impacts resulting from pollutants leaching into the ground water from combustion residual surface impoundments and landfills. Additionally, the models used for this EA did not consider pollutant loadings to surface waters caused by combustion residual pollutants migrating through the soil and into surface waters, even though this may be occurring at many of the plants. As shown in Tables A-4 and A-5 in Appendix A, several damage cases have documented impacts to surface waters due to ground water contamination from combustion residual surface impoundments and landfills. The EA may therefore underestimate the number of cases where water quality standards are being exceeded in immediate receiving waters (see Section 6).

On April 17, 2015, EPA published a RCRA rule that regulates the disposal of CCRs from steam electric power plants (80 FR 21302). As part of the final CCR rulemaking, EPA's Office of Solid Waste and Emergency Response (OSWER) evaluated ground water contamination associated with combustion residuals in surface impoundments and landfills. The ground water impact analysis for the CCR rule identified and quantified human health risks to private drinking water wells due to potential ground water contamination from current CCR management practices. The analysis determined that human health risks were primarily from exposures to arsenic and molybdenum in ground water used as a source of drinking water. EPA identified additional human health risks from exposures to boron, cadmium, cobalt, fluoride, mercury, lithium, and thallium in ground water used as drinking water at certain sites based on the CCR disposal practices. Refer to the Regulatory Impact Analysis: EPA's 2015 RCRA Final Rule Regulating Coal Combustion Residual (CCR) Landfills and Surface Impoundments at Coal-Fired Electric Utility Power Plants (EPA-HQ-RCRA-2009-0640-12034) for the results of the national-scale analysis of ground water impacts.

4.3 Combustion Residual Surface Impoundments as Attractive Nuisance

An "attractive nuisance" is an area or habitat that attracts wildlife and is contaminated with pollutants at concentrations high enough to potentially harm exposed organisms. Two methods of handling steam electric power plant wastewater, surface impoundments and constructed wetlands, are classified as lentic systems supporting aquatic vegetation and organisms. These methods have been known to attract wildlife from other terrestrial habitats and therefore can be considered attractive nuisances. As an attractive nuisance, a surface impoundment can impact local wildlife as well as transient species that might rely on them during critical reproduction periods such as seasonal breeding events [Rowe *et al.*, 2002].

Exposure to steam electric power plant wastewater during sensitive life cycle events is a concern given that it has been associated with complete reproductive failure in various vertebrate species [Cumbie and Van Horn, 1978; Gillespie and Baumann, 1986; Lemly, 1997a; Pruitt, 2000].

Organisms that frequent attractive nuisance sites at steam electric power plants, such as surface impoundments, risk exposure to elevated pollutant concentrations. Several studies have shown that terrestrial fauna nesting near combustion residual surface impoundments can have higher levels of arsenic, cadmium, chromium, lead, mercury, selenium, strontium, and vanadium than the same species at reference sites [Bryan *et al*., 2003; Burger *et al*., 2002; Hopkins *et al*., 1997, 1998, 2000, 2006; Nagle *et al*., 2001; Rattner *et al*., 2006]. Table A-8 in Appendix A summarizes documented examples of impacts to wildlife associated with attractive nuisances at steam electric power plants.

In several of these instances, histopathological effects (*i.e.*, changes in pollutant tissue concentrations) were observed. For example, birds nesting near a combustion residual surface impoundment produced eggs with higher selenium concentrations than eggs found at the reference site. Although egg selenium concentrations near combustion residual surface impoundments exceeded thresholds that signify adverse effects on reproduction, the study did not observe any reduction in reproductive success [Bryan *et al*., 2003]. In a study conducted by Hopkins *et al*. [1998], sediment from a contaminated combustion residual surface impoundment had arsenic levels more than 100 times higher than the levels found in reference site sediments. Adult toads captured in the contaminated surface impoundment reported a sevenfold difference in arsenic levels between those from reference sites [Hopkins *et al*., 1998]. Although the study did not measure any indicators of reduced survival or reproductive success in the toads, the results indicate that exposure to combustion residual surface impoundments are a potential threat [Hopkins *et al*., 1998].

Surface impoundments and constructed wetlands can act as attractive nuisances by attracting wildlife and exposing them to elevated pollutant levels.

Multiple studies have linked attractive nuisance areas at steam electric power plants to diminished reproductive success. Field studies have documented adverse effects on reproduction for turtles and toads living near selenium-laden combustion residual surface impoundments [Hopkins *et al*., 2006; Nagle *et al*., 2001]. In another study, an interior least tern *(Sternula antillarum),* an endangered migratory bird, began nesting at Gibson Lake, an artificial shallow pond that receives combustion residual surface impoundment effluent from the Gibson Generating Station in Indiana. Within several years, nearby combustion residual surface impoundments at the Gibson Generating Station were also attracting nesting least terns, placing these sensitive species in direct contact with steam electric power plant wastewater. To address the attractive nuisance problem presented by the surface impoundments, the Gibson Generating Station began a cooperative program with the Indiana Department of Natural Resources to

protect the nesting birds by creating a nearby alternative habitat known as the Cane Ridge Wildlife Management Area (WMA) [Pruitt, 2000]. Cane Ridge WMA received water from Gibson Lake and, in 2008, the U.S. Fish and Wildlife Service became concerned about selenium levels in the water and fish present in the Cane Ridge WMA [USFWS, 2008]. Accordingly, the bottom of Cane Ridge was plowed to redistribute and bury the selenium in the soil and the water flowing from Gibson Lake into Cane Ridge was stopped and replaced with water piped from the Wabash River. Duke Energy paid to stock the Cane Ridge WMA ponds with fathead minnows to lure back migratory birds. As of June 2009, avocets, dunlins, black terns, Forster's terns, Caspian terns, and 50 endangered least terns have returned to Cane Ridge [USFWS, 2012].

Other well-documented cases of attractive nuisance settings with characteristics (*e.g.*, elevated concentrations of specific pollutants) similar to those associated with steam electric power plants provide further support that combustion residual surface impoundments have the potential to pose a threat to wildlife. For example, exposed organisms in attractive nuisance settings affected by urban and agricultural wastes have exhibited elevated tissue concentrations of pollutants, with some organisms experiencing a combination of reproductive or sublethal effects that adversely impact their survival [Clark, 1987; Hofer *et al*., 2010; King *et al*., 1994; Ohlendorf *et al*., 1986, 1988a, 1988b, 1989, 1990; Tsipoura *et al*., 2008]. Although these examples do not directly relate to steam electric power plants, they highlight the potential dangers of attractive nuisances and ability for pollutants to bioaccumulate in the surrounding wildlife [Ohlendorf *et al*., 1986, 1989, 1990]. Table A-9 in Appendix A summarizes documented examples of impacts to wildlife associated with attractive nuisances that are not specific to steam electric power plants.

SECTION 5
SURFACE WATER MODELING

Based on the documented environmental impacts discussed in the literature, EPA identified several key environmental and human health concerns and pathways of exposure to evaluate in the environmental assessment (EA). Environmental concerns include degradation of surface water, sediment, and ground water quality; toxic effects on aquatic and benthic organisms; bioaccumulation of contaminants and resultant toxic effects on wildlife; toxic effects on humans consuming contaminated fish; and contamination of drinking water resources.

EPA focused its quantitative analyses on discharges of the evaluated wastestreams to surface water – one of the primary exposure pathways of concern discussed in Section 4. To quantify baseline impacts and improvements under the final steam electric effluent limitations guidelines and standards (ELGs), EPA developed models to determine pollutant concentrations in the immediate receiving waters, pollutant concentrations in fish tissue, and exposure doses to ecological and human receptors from consuming aquatic organisms. This section describes the immediate receiving water (IRW) model and the ecological risk model used in developing this EA. Section 8 describes the development and execution of case study models using EPA's Water Quality Analysis Simulation Program (WASP) to supplement the results of the IRW model.

5.1 IMMEDIATE RECEIVING WATER (IRW) MODEL

EPA developed the IRW model[33] to quantify the environmental impacts to surface waters, wildlife, and human health from the wastestreams evaluated for the regulatory options. As part of this national assessment, EPA determined impacts in the immediate surface water where steam electric power generating industry discharges occur, between 1 and 5 miles from the outfall depending on the stream reach.[34] As part of the benefits and cost analysis, EPA also evaluated surface water concentrations downstream from steam electric discharges using EPA's Risk-Screening Environmental Indicators (RSEI) model; see the Benefits and Cost Analysis (EPA-821-R-15-005). The IRW model framework focused on four key areas of impacts:

- Impacts to aquatic life based on reduction in water quality from discharges of the evaluated wastestreams.
- Impacts to aquatic life based on reduction in sediment quality from discharges of the evaluated wastestreams.
- Impacts to wildlife from the bioaccumulation of contaminants in aquatic organisms and fish, including piscivorous (fish-eating) wildlife.
- Impacts to human health from consuming contaminated fish.

[33] The IRW model is the same model that EPA used for the national-scale analyses in support of the proposed ELGs. EPA assigned the "IRW model" label to help distinguish the national-scale model from the case study models developed in support of the final ELGs.
[34] See the ERG memorandum "Water Quality Module: Plant and Receiving Water Characteristics" (DCN SE04513) for details on the immediate discharge zone and length of stream reach represented.

As discussed in Section 4.1.2, EPA considered the type of receiving waters commonly impacted by steam electric power plants and the pollutants typically found in the evaluated wastestreams in selecting the appropriate methodologies for the quantitative analysis. The IRW model quantified the environmental risks within rivers/streams and lakes/ponds/reservoirs, and evaluated impacts from 10 toxic, bioaccumulative pollutants: arsenic, cadmium, copper, hexavalent chromium (chromium VI), lead, mercury, nickel, selenium, thallium, and zinc. EPA's IRW model includes three interrelated modules:

- Water quality module—calculates immediate-receiving-water-specific pollutant concentrations in the water column and sediment and evaluates the impacts that receiving water concentrations pose to aquatic life and human health.
- Wildlife module—evaluates the impact that sediment concentrations pose to aquatic life, calculates the pollutant concentrations in exposed fish populations, and evaluates the potential adverse effects to minks and eagles from consuming fish.
- Human health module—calculates non-cancer and cancer risks to human populations from consuming fish.

Additionally, EPA used the selenium outputs from the IRW water quality module to evaluate the risks to fish and waterfowl that consume aquatic organisms with elevated levels of selenium (see Section 5.2). This ecological risk analysis expands on the results of the IRW wildlife module described in this section.

The IRW water quality module uses plant-specific input data (plant-specific pollutant loadings and cooling water flow rate),[35] surface-water-specific characteristic data (*e.g.*, receiving water flow rate, lake volume), and representative environmental parameters (*e.g.*, partition coefficients) to quantify the environmental impacts of the evaluated wastestreams to surface waters. The module calculates pollutant concentrations in the surface water and sediment. These concentrations are inputs to the IRW wildlife module, which calculates the bioaccumulation of pollutants in fish tissue and determines impacts to wildlife. The fish tissue concentration calculated in the IRW wildlife module becomes an input to the IRW human health module. This section provides overviews of each module. Appendices C through E describe the IRW model equations, input data, and assumed environmental parameters in further detail. The appendices also describe the limitations and assumptions of the IRW model.

Figure 5-1 provides an overview of the IRW model inputs and the connections among the three modules to support EPA's national-scale modeling framework.

[35] EPA calculated annual pollutant loadings for the evaluated wastestreams and excluded any pollutants discharged with other wastewaters (*e.g.*, coal pile runoff). EPA incorporated cooling water flow rates into the IRW water quality module on a site-by-site basis. EPA assumed no pollutant loadings were associated with cooling water discharges to surface waters and used cooling water flow rates only to evaluate dilution effects.

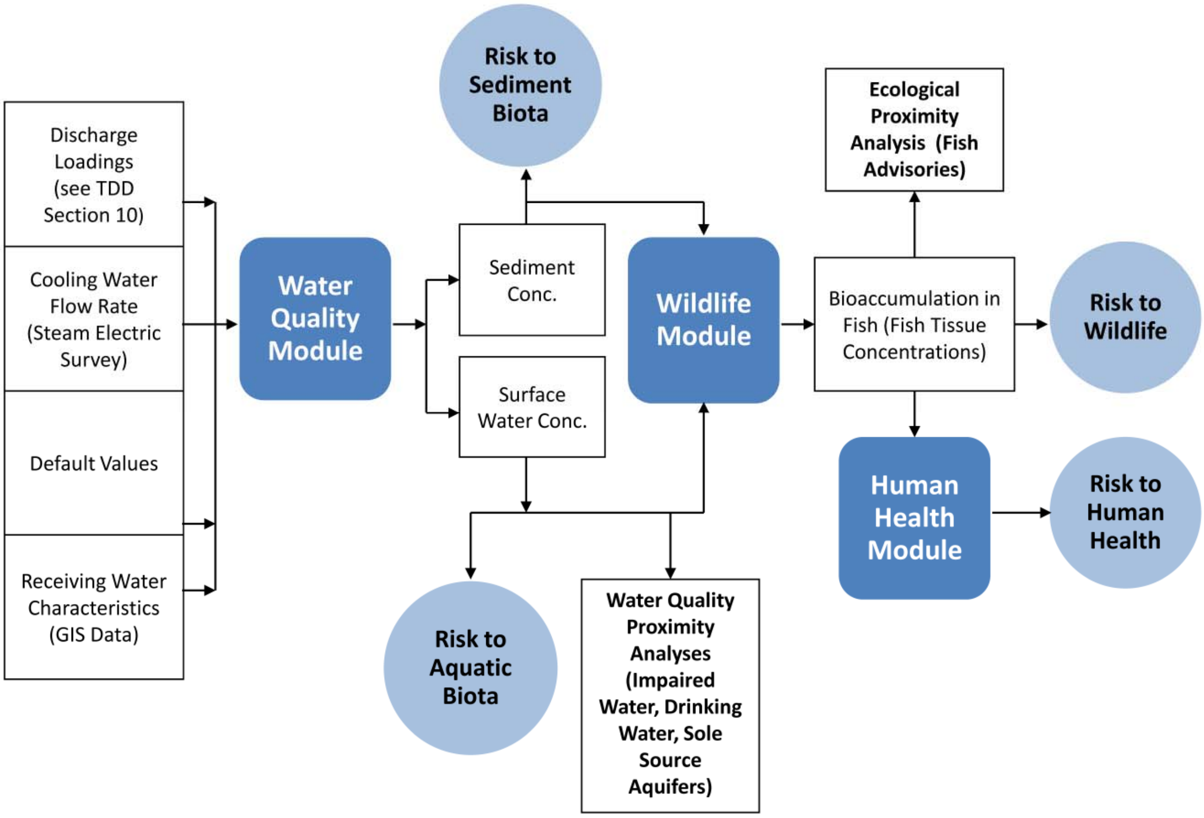


Figure 5-1. Overview of IRW Model

5.1.1 Water Quality Module

EPA selected the steady-state equilibrium-partitioning model described in EPA's *Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions* (EPA 600-R-98-137) for the IRW water quality module. This selection was based on three factors: 1) the model's ability to represent pollutants in the aquatic environment; 2) the model's complexity, which EPA judged to be appropriate for a national-scale evaluation;[36] and 3) the level of previous Agency and external peer reviews performed on the modeling methodology. An equilibrium-partitioning model assumes that dissolved and sorbed pollutants in a receiving water will quickly attain equilibrium in the immediate vicinity of the discharge point because they dissolve or sorb in the surface water faster than they can be transported or dispersed outside that area. The model also assumes that the equilibrium state for each pollutant can be represented by a partition coefficient that divides the total mass of a pollutant in the waterbody into four compartments:

- Constituents dissolved in the water column.
- Constituents sorbed onto suspended solids in the water column.

[36] For a national-scale environmental assessment of over 200 receiving waters, data limitations inhibit the feasibility of using more complex fate and transport receiving water models (dynamic or hydrodynamic) to estimate surface water concentrations.

- Constituents sorbed onto sediments at the bottom of the waterbody.
- Constituents dissolved in pore water in the sediments at the bottom of the waterbody.

Table 5-1 lists the pollutants commonly found in the evaluated wastestreams with known environmental impacts (see Section 3.1, Table 3-1). EPA selected a subset of these pollutants for the water quality model based on the following criteria:

- The pollutant is known to be present in the evaluated wastestreams (*i.e.*, identified as a pollutant of concern).
- Scientific literature documents elevated levels observed in surface waters or wildlife from exposure to steam electric power plant wastewater.
- Partition coefficient data are available for the water quality model.
- Benchmarks are available to evaluate potential threats to wildlife or human health.

For the immediate receiving water quality analysis, EPA modeled 10 of the pollutants shown in Table 5-1: arsenic, cadmium, chromium VI, copper, lead, mercury, nickel, selenium, thallium, and zinc.

Table 5-1. Pollutants Considered for Analysis in the Immediate Receiving Water Model

Pollutant	POC [a]	Literature Review [b]	Partition Coefficient [c]	NRWQC [d]	Maximum Contaminant Level (MCL)	Wildlife Benchmark [e]	Human Health Benchmark [f]	Included in Modeling Analysis [g]
Aluminum	✓			✓			✓	
Arsenic [h]	✓	✓	✓	✓	✓	✓	✓	✓
Boron	✓			✓			✓	
Cadmium	✓	✓	✓	✓	✓	✓	✓	✓
Chromium [i]	✓	✓	✓	✓	✓	✓	✓	✓
Copper	✓	✓	✓	✓	✓	✓	✓	✓
Iron	✓			✓			✓	
Lead	✓		✓	✓	✓	✓		✓
Manganese	✓			✓			✓	
Mercury [j]	✓	✓	✓	✓	✓	✓	✓	✓
Nickel	✓	✓	✓	✓		✓	✓	✓
Selenium [k]	✓	✓	✓	✓	✓	✓	✓	✓
Thallium	✓		✓	✓	✓		✓	✓
Vanadium	✓	✓	✓				✓	
Zinc	✓		✓	✓		✓	✓	✓

a – A check mark indicates that the pollutant is a pollutant of concern (POC) for one or more of the evaluated wastestreams (see Section 6 of the Technical Development Document (TDD) (EPA-821-R-15-007)).

b – Literature review identified documented cases of elevated pollutant levels in surface waters or wildlife near steam electric power plants [ERG, 2013b; ERG, 2015m].

c – Partition coefficients for modeling analysis identified in U.S. EPA, 1999, and U.S. EPA, 2005a.

d – National Recommended Water Quality Criteria (NRWQC) are available at http://water.epa.gov/scitech/swguidance/standards/current/index.cfm.

e – No effect hazard concentration (NEHC) identified in USGS, 2008, for minks and bald eagles.

f – Reference dose (RfD) identified in EPA's Integrated Risk Information System (IRIS) for all pollutants except copper and thallium (available at http://www.epa.gov/iris/); RfD for copper is the intermediate oral minimal risk level (MRL) [ATSDR, 2010a]; and RfD for thallium is the value for thallium chloride provided in U.S. EPA, 2010a. Cancer slope factor for arsenic identified in EPA's Integrated Risk Information System (IRIS) database [2011].

g – Pollutant is included in the quantitative modeling analysis discussed in this section.

h – Arsenic exists in two primary forms: arsenic III (arsenite) and arsenic V (arsenate). A check mark indicates that total arsenic, arsenite, and/or arsenate satisfied the criterion in the table header.

i – Chromium exists in two primary forms: chromium III and chromium VI. A check mark indicates that total chromium and/or chromium VI satisfied the criterion in the table header.

j – A check mark indicates that mercury and/or methylmercury satisfied the criterion in the table header.

k – Selenium exists in two primary forms: selenium IV (selenite) and selenium VI (selenate). A check mark indicates that total selenium, selenite, and/or selenate satisfied the criterion in the table header.

EPA developed the IRW water quality module in Microsoft Access™ using the equilibrium-partition equations presented in Appendix C. The IRW water quality module is a mathematical model used to represent the partitioning of pollutants through the surface water after the wastestream has been discharged. The module output provides site-specific pollutant concentrations in the water column (total, dissolved, and suspended) and sediment for 188 steam electric power plants located across the United States that discharge to a river or stream or to a lake, pond, or reservoir. Figure 5-2 depicts the pollutant concentrations calculated in the IRW water quality module. EPA implemented this modeling approach through the following steps:

1. Characterize the immediate receiving water characteristics (*e.g.*, depth of water column, depth of waterbody, receiving water width, and flow independent mixing value) using site-specific inputs. See the ERG memorandum "Water Quality Module: Plant and Receiving Water Characteristics" (DCN SE04513).

2. Using the immediate receiving water characteristics, determine the fraction of pollutant in the benthic sediment and in the water column and determine fraction of pollutant in the water column that is dissolved.

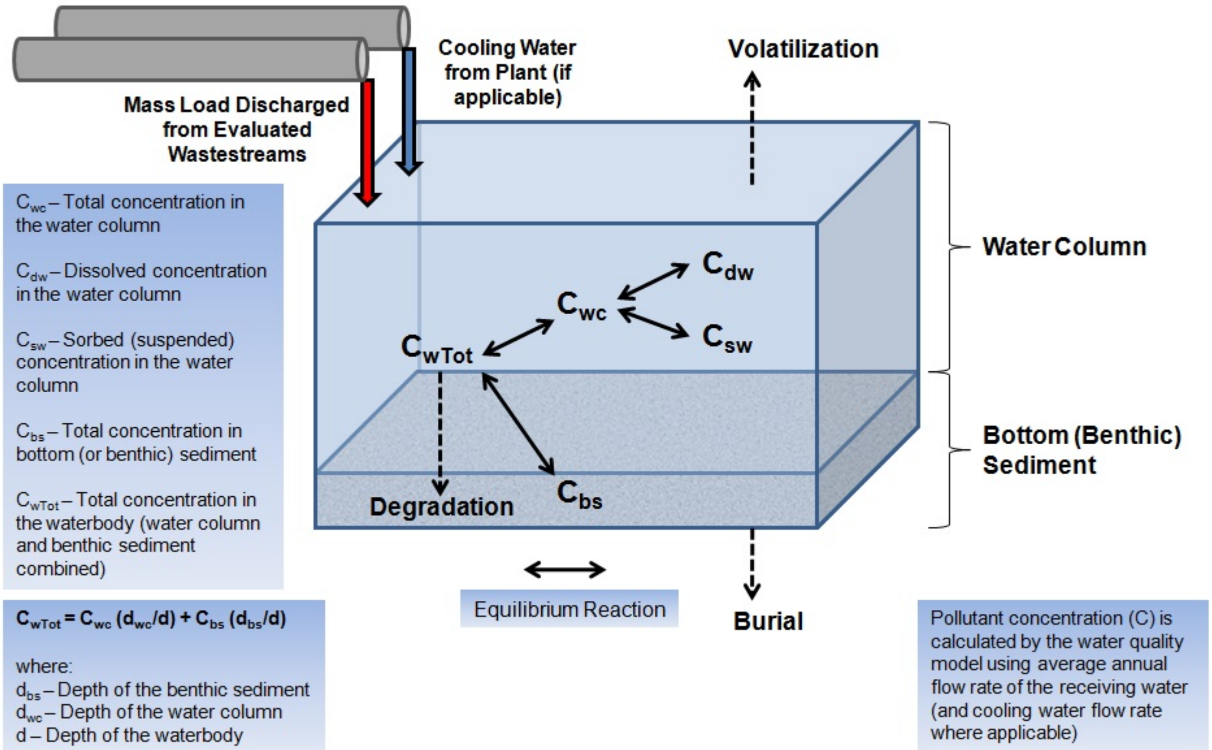
3. Using the immediate receiving water characteristics and assumed input values, calculate the water column volatilization rate constant, for volatile pollutants only (*i.e.*, mercury).

4. Calculate the water concentration dissipation rate (zero for nonvolatile pollutants).

5. Based on site-specific pollutant loadings (converting annual loadings to an average daily loading), cooling water flow rates (for a subset of plants), and immediate receiving water characteristics, calculate the total pollutant concentrations (*e.g.*, total arsenic) in the immediate receiving water, including the concentration in the water column and in the benthic sediment.

6. Calculate the concentration of dissolved pollutant in the water column. Section 10 of the TDD details the pollutant loadings methodology; the ERG memorandum "Water Quality Module: Plant and Receiving Water Characteristics" (DCN SE004513) describes the use of cooling water flow rates. Note that the pollutant loadings included in the module do not represent the total pollutant loadings from steam electric power plants; several wastestreams were not evaluated (*e.g.*, stormwater runoff, metal cleaning wastes, coal pile runoff). In addition, the module uses an annual average discharge rate, assuming no seasonal or daily variation.

7. Quantify the number of sites that exceed the NRWQC and drinking water maximum contaminant levels (MCLs) to evaluate the potential exposure of ecological receptors (*i.e.*, aquatic biota) and human receptors to toxic pollutants in the environment from the evaluated wastestreams.



Source: Adapted from U.S. EPA, 1998b.

Figure 5-2. Water Quality Module: Pollutant Fate in the Waterbody

As an indicator of potential impacts, EPA compared the immediate receiving water concentrations (under baseline and regulatory options) to the following NRWQCs:

- Freshwater acute and chronic aquatic life NRWQC.
- Human health NRWQC for the consumption of water and organisms.
- Human health NRWQC for the consumption of organisms.

EPA also compared immediate receiving water concentrations to drinking water MCLs. EPA identified immediate receiving waters that exceeded a NRWQC or MCL as an indication of the degradation of the overall water quality following exposure to the evaluated wastestreams. Section 6.3 summarizes the NRWQC and MCL exceedances under baseline pollutant loadings. Section 7.2 presents the percent reduction in number of immediate receiving waters that potentially impact water quality under the final rule.

As with any modeling, EPA recognizes that model limitations exist and certain assumptions need to be made. EPA used average annual pollutant loadings and normalized effluent flow rates, which do not take into account temporal variability (*e.g.*, variable plant operating schedules, storm flows, low-flow events, catastrophic events). The IRW water quality module does not account for ambient background pollutant concentrations or contributions from other point and nonpoint sources, and assumes a constant flow rate in the receiving water based on the annual average reported in National Hydrography Dataset Plus (NHDPlus). Appendix C discusses these and additional module-specific limitations and assumptions and Section 6 and

Section 7 present the results of the IRW water quality module under baseline and regulatory options.

5.1.2 Wildlife Module

As shown in Figure 5-1, the IRW wildlife module builds off the IRW water quality module by using the calculated immediate receiving water and sediment concentrations to calculate pollutant concentrations in fish populations exposed to the evaluated wastestreams and to assess the potential to impact wildlife for the following categories:

- Impact to aquatic organisms from contact with sediment contaminated by the evaluated wastestreams. To do this, the model quantifies the number of sites with potential exposure of ecological receptors (*i.e.*, sediment biota) to the pollutant in the environment.
- Impact to piscivorous wildlife (*i.e.*, wildlife that habitually feeds on fish) from consuming fish impacted by the evaluated wastestreams. To do this, the model quantifies the number of sites with potential exposure of ecological receptors (*i.e.*, piscivorous wildlife) to the pollutant in the environment.

EPA developed the wildlife model in Microsoft Access™ to calculate pollutant concentrations in fish populations exposed to the evaluated wastestreams and estimate daily contaminant dose for wildlife receptors (*i.e.*, minks and eagles) using equations presented in Appendix D. EPA determined potential impacts to wildlife by comparing the concentration in the contaminated media (*i.e.*, water, sediment, or fish) to concentrations known to be protective of negative impacts (*i.e.*, benchmark). Benchmarks, which are pollutant- and endpoint-specific and sometimes are species-specific, are an expression of the concentration level in contaminated media that is protective against a specific endpoint (*e.g.*, mortality). Endpoints frequently reflected in benchmark values include sublethal effects (*e.g.*, reduced reproduction, neurological effects) and lethal effects. EPA implemented the wildlife modeling approach through the following steps:

1. Compare the concentration of the contaminant in benthic sediment to the benchmark for sediment biota.
2. Calculate the pollutant concentration in fish for trophic level three (T3) or trophic level four (T4),[37] using the calculated pollutant concentration in the water column and the bioaccumulation factor (BAF) or bioconcentration factor (BCF).[38] For mercury, calculate the concentration of methylmercury in the fish. See Appendix D for details on the IRW wildlife module and calculation of methylmercury concentration in fish.
3. Compare the concentration of the contaminant in the fish to the wildlife benchmarks for ecological receptors (*i.e.*, mink and eagle).

[37] T3 fish (*e.g.*, carp, smelt, perch, catfish, sucker, bullhead, sauger) are those that primarily consume invertebrates and plankton, while T4 fish (*e.g.*, salmon, trout, walleye, bass) are those that primarily consume other fish.

[38] BCFs are more appropriate for use with pollutants where the primary pathway entering fish tissue is via the water, whereas BAFs are more appropriate for pollutants where the primary pathway entering fish tissue is through a food source (takes into account both water and diet). Where available, EPA used pollutant-specific BAFs.

4. Compare the baseline and regulatory option results (*i.e.*, number of sites with potential exposure of ecological receptors to concentrations above protective benchmarks).

Adverse Effects to Aquatic Organisms from Contact with Sediment

EPA compared the concentration in the benthic sediment to benchmarks protective of benthic organisms. EPA used threshold effects level (TEL) benchmarks provided in the National Oceanic and Atmospheric Administration (NOAA) 2008 Screening Quick Reference Tables (SQuiRTs), referred to as the chemical stressor concentration limit (CSCL), for the sediment biota adverse impacts analysis. The CSCL is a chemical-specific media concentration that is protective of ecological receptors of concern. The CSCL benchmark is species-specific, but can be used to represent a community of organisms, such as amphibians or fish. Usually the most sensitive (or lowest) CSCL for a species is used to represent the community. Table D-1 in Appendix D presents the benchmarks used for sediment exposure analysis. Section 6.2 discusses the results of this analysis for baseline pollutant loadings.

Assessment of Pollutant Bioconcentration in Fish

EPA calculated fish tissue concentrations based on the following: 1) total water column concentrations (*i.e.*, dissolved plus sorbed) calculated in the IRW water quality module, and 2) trophic-level-specific BAFs or BCFs. BAFs and BCFs are based on field and laboratory study results compiled to develop a single factor or ratio for estimating the amount of pollutant transferred into fish tissue at a given trophic level (*i.e.*, rank in the food chain) based on the pollutant concentration in the waterbody. EPA estimated fish tissue concentrations in milligrams per kilogram (mg/kg) for T3 and T4 fish to account for the variability in fish likely consumed by both wildlife and human receptors included in the IRW model.

Although using the total water column concentration in the bioaccumulation analysis may overestimate the level of pollutants in the fish, it provides for a more environmentally protective estimate of risk in the subsequent human health model because it assumes that all pollutants within the waterbody (both dissolved and sorbed) are bioavailable to the exposed fish. The exception to this methodology is mercury, where EPA based the fish tissue concentration calculation on the dissolved concentration of methylmercury in the waterbody [U.S. EPA, 2005b]. Appendix D presents the BCFs and model equations for the analysis of pollutant bioconcentration in fish tissue for T3 and T4 fish. EPA used the fish tissue concentrations to evaluate impacts to piscivorous wildlife (see next section) and impacts to human health receptors (see Section 5.1.3).

Impact to Piscivorous Wildlife

EPA based the piscivorous wildlife impact analysis on the methodology outlined in the 2008 U.S. Geological Survey (USGS) study *Environmental Contaminants in Freshwater Fish and Their Risk to Piscivorous Wildlife Based on a National Monitoring Program*. The study examined the impacts to minks and eagles from eating contaminated fish. Minks and eagles are commonly used in ecological risk assessments as indicator species for potential impacts to fish-eating mammals and birds in areas contaminated with bioaccumulative pollutants [USGS, 2008]. Minks and eagles are appropriate receptors for the steam electric power plant wildlife impact

analysis because their habitats span most of the country and their diet largely consists of adult fish from the two trophic levels (*i.e.*, T3 and T4 fish) included in the IRW wildlife module. According to the literature [U.S. EPA, 1998a], minks consume mostly T3 fish, while eagles consume mostly T4 fish. EPA evaluated the potential adverse effects to minks and eagles for nine pollutants commonly found in the wastestreams of interest: arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium, and zinc.[39] The USGS method [USGS, 2008] is a wildlife impact analysis using NOAELs (no-observed-adverse-effect levels), which were derived from adult dietary exposure or tissue concentration studies based primarily on reproductive endpoints. The study calculated a NEHC benchmark, which is based on the NOAEL, the food consumption rate, and/or the biomagnification factor of each receptor. The report states that piscivorous wildlife may be at an elevated risk for reduced reproduction rates if the measured pollutant concentration in fish exceeds the NEHC. Therefore, EPA compared the mink-specific and eagle-specific NEHC values from the USGS study with the T3 and T4 fish tissue concentrations, respectively, to identify potential adverse impacts to the ecological receptors. In the piscivorous wildlife analysis, a benchmark exceedance indicates that piscivorous mammals or birds exposed to fish in the immediate receiving water of interest are at an elevated risk for reduced reproduction rates or other health effects.

Table D-3 in Appendix D presents the NEHC values used to evaluate potential adverse effects to wildlife. The text of Appendix D presents the equations used to compare model outputs to benchmarks (NEHCs), along with model-specific limitations and assumptions. The results of the IRW wildlife module under baseline conditions and the final rule are included in Section 6 and Section 7, respectively.

5.1.3 <u>Human Health Module</u>

As shown in Figure 5-1, the IRW human health module builds off the IRW wildlife module, using the calculated T3 and T4 fish tissue concentrations. Its purpose is to evaluate the cancer risk and potential to cause non-cancer health effects from consuming fish within the following age and consumption categories:

- Child recreational fishers (six cohorts covering different age ranges).[40]
- Child subsistence fishers (six cohorts covering different age ranges).
- Adult recreational fishers.
- Adult subsistence fishers.

In addition, EPA evaluated potential impacts to different race populations using these same cohorts as part of its environmental justice analysis. See the *Regulatory Impact Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category* (RIA) (EPA-821-R-15-004).

[39] Because there are no benchmarks for chromium VI or methylmercury, EPA used the total chromium and total mercury benchmarks, respectively, which may underestimate the risk to wildlife.

[40] The child cohort age ranges correspond to the ranges provided in the 2008 *Child-Specific Exposure Factors Handbook* (EPA-600-R-06-096F) for body weights.

EPA developed the IRW human health module in Microsoft Access™ to estimate the daily pollutant doses for human receptors as a result of eating T3 and T4 contaminated fish. EPA used a mathematical model to estimate the potential threats to human receptors from pollutant exposure. EPA estimated the average concentration of pollutants in a fish fillet consumed by humans based on a consumption diet of 36 percent T3 and 64 percent T4 fish (see Appendix E). The IRW human health module then calculates the daily dose of pollutants from fish consumption for each cohort included in the analysis. EPA varied the fish consumption rate based on the specific cohort using two factors: 1) type of fisher (recreational or subsistence) and 2) age (adult and six child cohorts). EPA first evaluated human health impacts based on type of fisher and age of cohort using national-level consumption rates. For the environmental justice analysis, EPA determined fish consumption rates using the race population in addition to the other two factors. See Appendix E for further details. Using the fish consumption rate, EPA determined an average daily pollutant dose for each human cohort evaluated. Table E-2 in Appendix E presents the cohorts included in the IRW human health module and the corresponding fish consumption rates used in the module. EPA implemented the human health modeling approach through the following steps:

1. Calculate the pollutant concentration in a fish fillet.
2. Calculate the average daily dose of pollutant from fish consumption by each receptor cohort (used for comparison to reference dose [RfD] values).
3. Calculate the lifetime average daily dose (LADD) for carcinogenic pollutants only, by each receptor cohort (used to determine cancer risk).
4. Calculate the lifetime excess cancer risk (LECR) for carcinogenic pollutants only, by each receptor cohort, using the LADD.
5. Compare the exposure doses of human receptor cohorts to appropriate benchmarks (RfD and selected cancer benchmark: 1-in-a-million).
6. Compare the baseline and regulatory option results: reduction in the number of immediate receiving waters with exposure doses from consuming fish that pose a potential threat to human receptors.

<u>Non-Cancer Threat to Human Receptors</u>

EPA evaluated the non-cancer threat (*e.g.*, reproductive or neurological impacts) to each cohort by comparing the pollutant-specific average daily dose values for fish consumption to the corresponding RfDs. EPA evaluated non-cancer risks for the following pollutants: inorganic arsenic,[41] cadmium, chromium VI, copper, methylmercury, nickel, selenium, thallium, and zinc. Table E-3 in Appendix E presents the RfD values used in the non-cancer threat analysis. RfD values are an expression of the consumption dose that is protective against a specific endpoint.

[41] For this analysis, EPA used only the concentration of inorganic arsenic for the human health impact assessment. Based on the literature review, arsenic in fish is mostly in the organic form and is not considered harmful. The wildlife model calculates a total arsenic fish tissue concentration. To convert this number to inorganic arsenic, EPA assumed that 4 percent of the total arsenic is inorganic based on EPA's 1997 document *Arsenic and Fish Consumption* (EPA-822-R-97-003). The 1997 document reported that the inorganic arsenic concentration in fish is between 0.4 and 4 percent of the total arsenic accumulating in fish [U.S. EPA, 1997b].

Endpoints frequently reflected in RfDs include various immunological, reproductive, neurological, and other non-cancer effects. In the IRW human health module, when the RfD is exceeded, it indicates a potential threat to humans for the endpoint associated with the RfD. For example, exceeding the RfD for selenium indicates that the exposure dose from fish consumption can cause non-cancer health effects, such as selenium-induced liver dysfunction or selenosis (hair or nail loss, morphological changes of the nails, etc.) [U.S. EPA, 2011c].

Cancer Risk to Human Receptors

Arsenic is the only pollutant included in the IRW model for which EPA has derived a cancer slope factor for ingestion exposures.[42] The IRW human health module calculates the LADD for each receptor cohort based on an exposure duration (*i.e.*, length of time a receptor is in contact with the carcinogen) averaged over a lifetime (*i.e.*, 70 years). For this analysis, EPA assumed the exposure duration to be equal to the number of years represented by each cohort. Using these exposure durations is appropriate for screening-level estimates of cancer risk and for comparing changes between baseline and regulatory options.[43] The model then multiplies the LADD by the cancer slope factor to calculate the LECR from arsenic. LECR is an estimate of the increase in cancer risk resulting from an exposure (*i.e.*, consumption of contaminated fish). EPA used the benchmark value for evaluating cancer risk of 1-in-a-million people. Therefore, a calculated LECR greater than 1×10^{-6} indicates an increased cancer risk for humans that consume fish exposed to discharges of evaluated wastestreams.

5.2 Ecological Risk Modeling

Selenium bioaccumulation in aquatic organisms occurs primarily from ingesting food rather than through direct exposure to dissolved selenium in the water column [Fan *et al*., 2002; Ohlendorf *et al*., 1986; Saiki and Lowe, 1987; Presser and Ohlendorf, 1987; Luoma *et al*., 1992; Presser *et al*., 1994; Chapman *et al*., 2009]. Unlike other bioaccumulative contaminants such as mercury, the single largest step in selenium accumulation in aquatic environments occurs in aquatic organisms at the base of the food web; algae, particulates, and microorganisms can accumulate selenium to levels far greater than the concentration in the water column. Bioaccumulation and transfer through aquatic food webs constitute the major selenium exposure pathway in aquatic ecosystems.

Macrophytes, algae, phytoplankton, zooplankton, and macroinvertebrates at the base of the food web easily bioaccumulate selenite and selenate and incorporate selenium in tissues as selenomethionine, an organo-selenide. This selenomethionine is then released back to the water

[42] Although EPA determined that lead and lead compounds can be "reasonably anticipated to be human carcinogens," no numeric value has been determined to quantify the cancer risk. As stated on the IRIS website, "quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used." (See http://www.epa.gov/iris/subst/0277.htm#reforal.)

[43] To completely assess risk to an individual, EPA recommends that risks should be calculated by integrating exposures throughout all life stages (*i.e.*, adding multiple cohort risks from screening analysis). For example, the exposure duration may be equal to the length of time a person lives in an area [U.S. EPA, 2011b].

column as these plants and organisms die or are consumed [U.S. EPA, 2014f]. In general, selenium concentrations in particulates (*e.g.*, sediment, detritus, and primary producers such as algae and biofilm) are 100 to 500 times higher than dissolved concentrations in selenate-dominated environments such as streams and rivers. Where selenite or organo-selenide is proportionately more abundant, such as in lakes, wetlands, some estuaries, and oceans, the ratio can be much higher (1,000 to 10,000 times higher than dissolved concentrations). This variability of particulate concentrations relative to dissolved concentrations across different aquatic environments makes it difficult to develop a simple relationship between the concentration of selenium in water and the concentration of selenium in organisms [Presser and Luoma, 2010].

The scientific community has devoted significant effort to understanding the mechanisms of selenium bioaccumulation. The preferred approach, as described in Presser and Luoma [2010], accounts for the variability in particulate concentrations described above by applying site-specific enrichment factors (EFs) that represent the ratio of the concentration of selenium at the base of the food web (*i.e.*, particulates) to the dissolved concentration in water. Subsequent bioaccumulation by aquatic organisms is described through a series of empirically derived, species-specific trophic transfer factors (TTFs) that link the selenium concentrations in particulates and invertebrates to higher trophic-level organisms such as fish and birds. TTFs can be derived from laboratory experiments or from field data. TTFs differ from traditional BCFs (described in Section 5.1.2) in that they are the ratio of the selenium concentration in each animal to the selenium concentration in its food, whereas BCFs represent the ratio of the selenium concentration in an animal to the selenium concentration in the water of its environment. Using TTFs therefore more accurately predicts selenium bioaccumulation in aquatic organisms because it accounts for the significant role of dietary exposure.

Selenium toxicity among exposed fish and birds primarily is transferred to the eggs and demonstrated via subsequent reproductive effects. Many studies and expert panels have shown that reproductive effects, linked to egg-ovary selenium concentrations, are of greatest concern and likely have led to observed reductions in sensitive fish species populations in waterbodies having excessive selenium concentrations [Chapman *et al*., 2009].

EPA developed and applied a probabilistic ecological risk model, based on the bioaccumulation concepts described above, to assess the risk of adverse reproductive impacts among fish and birds exposed to selenium in waterbodies that receive discharges of the evaluated wastestreams. Figure 5-3 provides a general schematic of the approach, which follows these general steps:

1. Apply a distribution of site-specific EFs (with separate distributions for lentic and lotic systems) to the predicted dissolved selenium concentration from the IRW water quality module, resulting in a distribution of predicted selenium concentrations in particulates and primary producers for each receiving water.
2. Apply a TTF distribution for invertebrates (TTF_{invert}) to the outputs from Step 1, resulting in a distribution of predicted selenium concentrations in invertebrates that inhabit each receiving water.
3. To predict the bioaccumulation and reproductive risk among fish:

a. Apply a TTF distribution for fish (TTF_{fish}) to the outputs from Step 2, resulting in a distribution of predicted selenium concentrations in the eggs and ovaries of fish that inhabit each receiving water (some of the TTFs incorporate tissue conversion factors to translate the outputs from whole body or muscle concentrations into fish egg-ovary concentrations).

b. Apply an exposure-response function for fish (ER_{fish}) to the outputs from Step 3a, resulting in a distribution showing the probability of a decline in reproductive success across exposed fish populations.

4. To predict the bioaccumulation and reproductive risk among birds (specifically, mallards):

   a. Apply a TTF distribution for mallards ($TTF_{mallard}$) to the outputs from Step 2, resulting in a distribution of predicted selenium concentrations in the eggs of mallards that forage and/or breed in each receiving water.

   b. Apply an exposure-response function for mallards ($ER_{mallard}$) to the outputs from Step 4a, resulting in a distribution showing the probability of a decline in reproductive success across exposed mallard populations.

This modeling approach is consistent with the approach taken in developing the External Peer Review Draft Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater [U.S. EPA, 2014f] (referred to as the external peer review draft selenium criterion) and is based on the same data sets and studies for EF, TTF_{invert}, TTF_{fish}, and ER_{fish}. For this EA, EPA expanded the model to include data sets for $TTF_{mallard}$ and $ER_{mallard}$ and to include several additional data sets and studies for EF, TTF_{invert}, TTF_{fish}, and ER_{fish} that were eventually incorporated into the Draft Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater [U.S. EPA, 2015b].

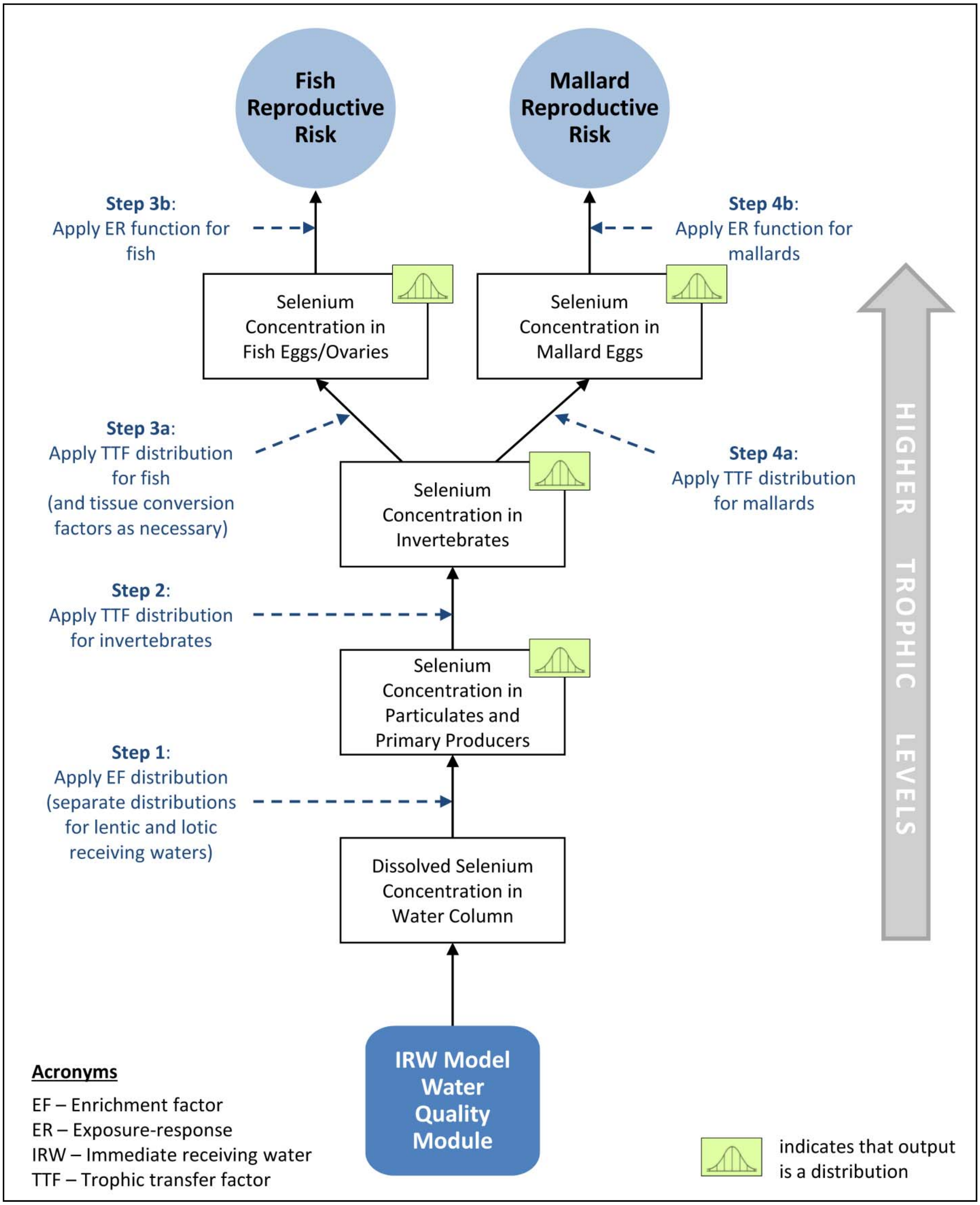


Figure 5-3. Flowchart of Selenium Ecological Risk Model

Detailed information for some of the factors that influence selenium bioaccumulation at a particular site, such as the form of selenium in the environment (*e.g.*, selenate, selenite, and organo-selenide) and the structure of the aquatic food web, is not available across the 209 immediate receiving waters modeled in this EA. The ecological risk model accounts for these unknowns by applying distributions of EFs and TTFs based on data representing a wide variety of lentic and lotic waterbodies and freshwater invertebrate and fish species, rather than relying on a single statistical measure (*e.g.*, mean or median) for those parameters. This approach accounts for the variability across aquatic systems and captures the full range of food web constructs that could occur in these receiving waters.

The remainder of this section further discusses EPA's development of the EFs, TTFs, and ER functions in the ecological risk model and use of those functions to calculate risk of adverse reproductive effects (performed using Oracle Crystal Ball software). Appendix F provides additional details regarding data sources, data acceptance criteria, statistical methods, and assumptions and limitations of the ecological risk model.

Enrichment Factors

EPA compiled a database of empirical measurements of selenium concentration (water, sediment, biofilm, algae, phytoplankton, and detritus) from relevant field studies across a range of aquatic systems. EPA then calculated EFs for a set of aquatic systems and applied statistical methods to distinguish categories with similar bioaccumulation characteristics, consistent with the approach followed in developing the external peer review draft selenium criterion [U.S. EPA, 2014f]. The key factor distinguishing EFs across systems is whether the data were collected from lentic systems (*e.g.*, lakes, reservoirs, and ponds) or lotic systems (*e.g.*, rivers, creeks, and streams). Therefore, the EPA developed EF distributions separately for lentic and lotic systems.

This effort produced EF distributions for both systems that are well described by lognormal distributions with means (standard deviations) of 1,738 (2,499)[44] for lentic systems and 692 (787) for lotic systems.

Trophic Transfer Factors for Invertebrates and Fish

EPA compiled a database of empirical measurements of selenium concentration in particulates, invertebrates, and fish from relevant field studies. EPA arranged the data by developing data pairs representing the concentration in the consumer organism (invertebrate or fish) and the concentration in the consumed material or lower-trophic-level organism (particulate or invertebrate). The ratio between these two values defines the TTF for the consumer organism. EPA limited these data pairs to measurements collected from the same aquatic site. EPA further limited the data pairs by excluding measurements of material or lower-trophic-level organisms deemed unlikely to be ingested by the higher-trophic-level organism. Many of the fish concentration measurements required a further conversion to the concentration of selenium in eggs, requiring a whole-body-to-egg/ovary conversion factor. This factor (egg/ovary concentration = whole body concentration × 1.9) is based on paired measurements from

[44] The EF incorporates a multiplier of 1,000. A mean EF of 1,738 for lentic systems indicates that, on average, the concentration of selenium at the base of the food web is 1.738 times greater than the dissolved concentration in water.

individual fish and is consistent with the value used to develop the external peer review draft selenium criterion [U.S. EPA, 2014f].

This effort resulted in a TTF_{invert} distribution with a mean (standard deviation) of 2.84 (2.49) and a TTF_{fish} distribution with a mean (standard deviation) of 1.6 (1.08).

Trophic Transfer Factors for Mallards

EPA selected the mallard (*Anas platyrhynchos*) as the representative bird species for the ecological risk analysis. The mallard has been extensively evaluated in both field and laboratory studies and has been shown to be relatively sensitive to selenium. Mallards are ubiquitous, occurring in every state at specific times during the year, and are the species with the highest probability of being found at any of the 209 modeled receiving waters. Dabbling ducks such as mallards contribute important ecosystem services, such as transferring eggs and seeds of aquatic organisms between isolated wetlands and maintaining the biodiversity of other organisms [Bengtsson *et al.*, 2014; Green and Elmberg, 2014].

Based on a review of Ohlendorf [2003], EPA developed a database of field measurements of mallards and their likely food sources, expressed as a ratio of measured egg concentrations to dietary concentrations. Many studies across a wide variety of species have shown that selenium concentrations in bird eggs range from roughly equal to or three or four times the concentrations in the diet of the female at the time of egg-laying [Ohlendorf and Heinz, 2011]. The resulting $TTF_{mallard}$ distribution is best described by a triangular distribution, with a likeliest value of 2.5, a minimum value of 0.4, and a maximum value of 4.1.

Exposure-Response Function for Fish

Larval mortality and reproductive teratogenesis (*i.e.*, deformities in offspring) from maternal transfer of selenium to eggs represent the most sensitive endpoints in fish. Deformities in fish that affect feeding or respiration can be lethal shortly after hatching. Deformities that are not directly lethal, but that distort the spine and fins, can affect larval survival by reducing swimming ability and overall fitness. EPA therefore selected larval mortality and deformities as the target endpoints for this analysis.

This approach is consistent with the approach taken to develop the external peer review draft selenium criterion, and used the same extensively peer-reviewed exposure-response function (*i.e.,* curve) as was used in that analysis [U.S. EPA, 2014f]. Appendix F provides the exposure-response function for fish, which translates the modeled egg-ovary concentration into the probability of adverse reproductive effects.

Exposure-Response Function for Mallards

To derive the exposure-response function for mallards, EPA used the same set of six progressive studies used to develop the $TTF_{mallard}$ distribution [Ohlendorf, 2003]. This approach ensures consistency in the predicted bioaccumulation and reproductive response across different selenium exposure levels.

The mallard exposure-response function in Ohlendorf [2003] is based on a regression meta-analysis of six different laboratory studies that evaluated the effect of selenium on mallard egg hatchability [Heinz *et al.,* 1987, 1989; Heinz and Hoffman, 1996, 1998; Stanley *et al.,* 1994, 1996]. This function formed the basis of the water quality criterion adopted by the Utah Water Quality Board for Lake Gilbert, and underwent peer review by EPA Region 8. For this analysis, EPA fit a logistic curve to the combined, control normalized data from the six mallard studies. Appendix F provides the resulting exposure-response function for mallards.

Calculation of Reproductive Risk

In this analysis, risk is defined as the probability of a percentage reduction in reproductive capacity based on larval mortality and deformity in fish and hatching success in mallards. For any given exposure concentration to selenium predicted from the EF-TTF model, the exposure-response function provides the probability of the effect occurring, termed a joint probability model.

The EF-TTF models provide the predicted exposure distributions in fish and mallard eggs. For each concentration, the probability of exposure occurring is compared to the probability of effect at that exposure level. The resulting functions provide the probability of larval mortality and deformities in fish and hatching failure in mallards.

SECTION 6
CURRENT IMPACTS FROM STEAM ELECTRIC POWER GENERATING INDUSTRY

EPA developed the immediate receiving water (IRW) model and ecological risk model described in Section 5 to quantify the current national-scale environmental impacts of direct surface water discharges of the evaluated wastestreams (*i.e.*, flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, and combustion residual leachate) from steam electric power plants. This section presents the baseline results of the modeled pollutant concentrations in surface waters and fish tissue and their potential impacts to aquatic life, wildlife, and human health.

6.1 WATER QUALITY IMPACTS

The quality of a surface water is defined by its chemical, physical, and biological characteristics and is measured to evaluate a water's potential to harm aquatic life and human health. EPA assessed the quality of surface waters that receive discharges of the evaluated wastestreams by comparing estimated pollutant concentrations in the water column to the National Recommended Water Quality Criteria (NRWQC) and drinking water maximum contaminant levels (MCLs). Based on the modeling results for surface water quality impacts, approximately 62 percent of the lakes, ponds, and reservoirs (16 out of 26) and 43 percent of the rivers and streams (78 out of 183) that receive discharges of the evaluated wastestreams have estimated pollutant concentrations that exceed these water quality benchmarks and may have quantifiably impaired water quality due to those discharges. Based on the modeling results, human health criteria exceedances are more prevalent among the immediate receiving waters than aquatic life criteria exceedances. Approximately 17 to 45 percent of the immediate receiving waters had modeled pollutant concentrations that exceed a human health criterion, while approximately 4 to 17 percent of the immediate receiving waters had modeled pollutant concentrations that exceed an aquatic life criterion. The difference between exceedances for human health and aquatic life criteria is due to the human health criteria for arsenic and thallium, which are significantly lower than the aquatic life criteria for most of the modeled pollutants.

Due to data limitations at the national scale, EPA did not include other pollutant sources (*e.g.*, naturally -occurring pollutants, nonpoint source discharges, or other point source discharges) in the IRW model. Quantified exceedances estimated by the IRW model represent environmental impacts due entirely to the pollutant loadings in discharges of the evaluated wastestreams from steam electric power plants. Table 6-1 presents the number and percentage of immediate receiving waters with estimated pollutant concentrations that exceed each water quality criterion under baseline conditions.

EPA identified arsenic, thallium, cadmium, and selenium as the primary pollutants contributing to the water quality exceedances, as shown in Table 6-1. Humans are primarily at risk for exposure to arsenic and thallium. Out of the 209 modeled immediate receiving waters:

- 94 exceed the human health NRWQC for the consumption of arsenic-contaminated water and organisms (0.018 micrograms per liter (μg/L)).

- 65 exceed the arsenic NRWQC for consumption of organisms only (0.14 µg/L).
- 49 exceed the human health NRWQC for the consumption of thallium-contaminated water and organisms (0.24 µg/L).
- 45 exceed the thallium NRWQC for consumption of organisms only (0.47 µg/L).

Therefore, humans consuming water and/or organisms inhabiting these waters are more at risk of arsenic-related effects (skin damage, cardiovascular disease, and cancer in the skin, lungs, bladder, and kidney) and thallium-related effects (changes in blood chemistry; damage to liver, kidney, and intestinal and testicular tissues; hair loss; and reproductive and developmental damage).

Aquatic organisms are primarily at risk due to exposure to cadmium and selenium. Estimated pollutant concentrations in approximately 15 percent of the immediate receiving waters (29 and 33 out of 209, respectively) exceed the aquatic life criterion for chronic exposure to cadmium- and selenium-contaminated waters (0.25 and 5 µg/L, respectively). Therefore, aquatic organisms inhabiting these waters are under a greater threat for cadmium-related effects (tissue damage and organ abnormalities) and selenium-related effects (reproductive failure, deformities, reduced growth, increased metabolic rates, and death). Sublethal and lethal impacts from chronic selenium exposure are frequently cited in literature. For more information on these impacts, refer to Section 3.1.1.

Table 6-1. Number and Percentage of Immediate Receiving Waters with Estimated Water Concentrations that Exceed the Water Quality Criteria at Baseline

Evaluation Criterion		Number of Immediate Receiving Waters Exceeding a Criterion [a]			
		Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Immediate Receiving Waters [b]	
				Number Exceeding	Percentage Exceeding
Aquatic Life Criteria	Freshwater Acute NRWQC	9	0	9	4%
	Freshwater Chronic NRWQC	30	5	35	17%
Human Health Criteria	Human Health Water and Organism NRWQC	78	16	94	45%
	Human Health Organism Only NRWQC	55	11	66	32%
	Drinking Water MCL	31	5	36	17%
Total Number of Unique Immediate Receiving Waters [c]		78	16	94	45%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: NRWQC (National Recommended Water Quality Criteria); MCL (maximum contaminant level).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

c – This represents the number of unique immediate receiving waters that exceeded at least one criterion.

Table H-1 in Appendix H presents additional details on the number and percentage of immediate receiving waters that are exceeding each water quality criterion by pollutant. For more detailed information on the modeled immediate receiving water concentrations under baseline conditions, see Figures H-1 to H-10 and Tables H-2 to H-11 in Appendix H.

6.2 WILDLIFE IMPACTS

As part of the national-scale wildlife impacts analysis, EPA assessed the impacts of the evaluated wastestreams on the following categories:

- Impacts to wildlife indicator species (*i.e.*, mink and eagle) due to consuming contaminated fish (using the wildlife component of the IRW model).
- Impacts to fish and waterfowl due to dietary exposure and trophic transfer of selenium (using the ecological risk model in combination with the water quality component of the IRW model).
- Impacts to benthic organisms due to contact with contaminated sediment (using the wildlife component of the IRW model).

The results of these analyses are described in the following sections.

6.2.1 <u>Impacts to Wildlife Indicator Species</u>

As described in Section 5.1.2, EPA assessed the potential impact to piscivorous wildlife from the evaluated wastestreams by modeling fish tissue pollutant concentrations and comparing these concentrations to no effect hazard concentrations (NEHC) for minks and eagles developed by the U.S. Geological Survey (USGS). Based on the estimated fish tissue concentrations, approximately 34 percent (71 out of 209) and 28 percent (58 out of 209) of the immediate receiving waters pose a potential threat to eagles and minks, respectively, through the consumption of contaminated fish. This result demonstrates that estimated pollutant concentrations in fish that inhabit receiving waters immediately downstream from steam electric power plant wastewater discharges pose a potential reproductive threat to surrounding minks and eagles and indicates the potential broader impacts that steam electric power plant wastewater discharges may pose to the greater environment as pollutants transfer from the aquatic environment and begin to accumulate in terrestrial food webs.

As expected, based on documented environmental impacts, modeling results indicate that pollutant concentrations in fish inhabiting lakes, ponds, and reservoirs are more likely to exceed the NEHC benchmarks than pollutant concentrations in fish inhabiting rivers and streams. The estimated fish tissue pollutant concentrations pose a potential reproductive threat to minks and eagles in approximately 46 percent of modeled lakes, ponds, and reservoirs (12 out of 26) and in 32 percent of rivers and streams (59 out of 183) that were evaluated. These results are expected, since fish populations inhabiting lake environments cannot travel to uncontaminated waters and therefore continue to bioaccumulate pollutants.

Table 6-2 presents the number and percentage of immediate receiving waters that exceed the USGS wildlife fish consumption NEHC for minks and eagles.

Table 6-2. Number and Percentage of Immediate Receiving Waters That Exceed Wildlife Fish Consumption NEHCs for Minks and Eagles (by Waterbody Type) at Baseline

Evaluation Criterion	Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Receiving Waters [a,b]	
			Number Exceeding	Percentage Exceeding
Mink fish consumption NEHC	47	11	58	28%
Eagle fish consumption NEHC	59	12	71	34%
Total Number of Unique Immediate Receiving Waters [c]	59	12	71	34%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: NEHC (No Effect Hazard Concentration).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

c – This represents the number of unique immediate receiving waters that exceed a criterion.

The pollutants found to present the greatest threat to minks and eagles from fish consumption were mercury and selenium. The modeled concentrations of mercury in fish tissue exceeded the NEHC benchmarks for minks and eagles in 26 and 34 percent of the modeled immediate receiving waters, respectively. Approximately 20 percent of the immediate receiving waters contained fish with modeled selenium concentrations exceeding a fish consumption NEHC benchmark for minks and eagles.

Table 6-3 presents the number and percentage of immediate receiving waters that exceed a USGS wildlife fish consumption NEHC for minks and eagles by pollutant.

6.2.2 Impacts to Fish and Waterfowl due to Dietary Selenium Exposure

As discussed in Section 5.2, EPA expanded upon the piscivorous wildlife benchmark analysis to include ecological risk modeling of the reproductive risks among fish and waterfowl that consume aquatic organisms contaminated with elevated levels of selenium. Selenium is of particular concern in aquatic environments because it can accumulate in sediment and biomagnify to toxic levels in fish inhabiting selenium-contaminated waters (even at relatively low concentrations), potentially eliminating piscivorous (fish-eating) wildlife higher in the food chain [Ohlendorf *et al*., 1988a]. Impacts to fish populations are well documented in the literature [Garrett and Inman, 1984; Lemly, 1985a; Sorensen *et al*., 1982]. While exposed fish populations may not experience lethal impacts, the sublethal damage to their reproductive systems can eventually impact the survivability of fish populations near steam electric power plants. The documented impacts at Belews Lake illustrate this is especially an issue in lakes, ponds, and reservoirs, where healthy fish populations cannot migrate and seek out alternative food sources. Decreased fish populations may cause cascading effects within the food web that can adversely affect other organisms in the ecosystem.

Table 6-3. Number and Percentage of Immediate Receiving Waters That Exceed Wildlife Fish Consumption NEHCs for Minks and Eagles (by Pollutant) at Baseline

Pollutant	Mink			Eagle		
	Fish Consumption NEHC (μg/g) [a]	Immediate Receiving Waters		Fish Consumption NEHC (μg/g) [a]	Immediate Receiving Waters	
		Number Exceeding [b]	Percentage Exceeding		Number Exceeding [b]	Percentage Exceeding
Arsenic	7.65	0	0%	22.4	0	0%
Cadmium	5.66	6	3%	14.7	4	2%
Chromium VI	17.7 [c]	0	0%	26.6 [c]	0	0%
Copper	41.2	1	<1%	40.5	1	<1%
Lead	34.6	1	<1%	16.3	2	1%
Mercury	0.37	55	26%	0.5	71	34%
Nickel	12.5	0	0%	67.1	0	0%
Selenium	1.13	42	20%	4	42	20%
Thallium	ID	NC	NC	ID	NC	NC
Zinc	904	1	<1%	145	5	2%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: ID (Insufficient data; no benchmarks were identified in the wildlife analysis for thallium); NC (Not calculated); NEHC (No Effect Hazard Concentration); μg/g (micrograms/gram).

a – The wildlife fish consumption NEHC represents the maximum pollutant concentration in the fish that will result in no observable adverse effects in wildlife (*i.e.*, minks or eagles) [USGS, 2008].

b – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

c – An NEHC benchmark is not available for chromium VI; therefore, EPA used the total chromium benchmark.

The results of the ecological risk model indicate that, under baseline conditions, discharges of selenium from steam electric power plants elevate the risk of adverse reproductive impacts among fish and mallards that inhabit, forage, or breed in the immediate receiving waters. These reproductive impacts include larval mortality and deformities among fish and reduced egg hatchability among mallards.

The ecological risk modeling results indicate that 15 percent of the lakes, ponds, and reservoirs (four out of 26) and 11 percent of the rivers and streams (20 out of 183) that receive discharges of the evaluated wastestreams present an elevated risk of negative reproductive impacts to fish. For mallards, the counts are slightly higher, with 19 percent of the lakes, ponds, and reservoirs (five out of 26) and 14 percent of the rivers and streams (26 out of 183) presenting these risks. These results support the conclusion that lentic systems, which have higher potential for pollutant retention due to longer residence times, are more likely to experience ecological impacts due to discharges from steam electric power plants.

The results described above represent those immediate receiving waters whose median modeled egg/ovary concentration is predicted to impact reproduction among at least 10 percent of the exposed fish or mallard population. As described below, however, adjusting these criteria reveals additional perspective regarding the prevalence of immediate receiving waters that may be causing reproductive impacts due to selenium exposure.

Selecting the 90th percentile modeled egg/ovary concentration, meaning there is a 10 percent probability that the egg/ovary concentrations are greater than the selected concentration, reveals that 20 percent of the immediate receiving waters (42 out of 209) present reproductive risks to at least 10 percent of the exposed fish population. The results for mallards (21 percent) are very similar. These counts are considerably higher than the results obtained using the median modeled egg/ovary concentration, indicating the potential for more widespread ecological impacts among those waterbodies and food webs that tend to experience higher bioaccumulation of selenium.

The results of the ecological risk model indicate that sublethal effects from dietary exposure to selenium (from discharges of the evaluated wastestreams) can lead to hidden population-level effects among exposed fish and waterfowl by reducing reproductive success. The results for mallards illustrate the broader effects throughout the food web that can result from exposure to waterbodies contaminated with selenium. These results also indicate that impacts to aquatic-dependent wildlife are not limited to piscivorous wildlife such as mink and eagles.

The ecological risk model accounts only for those reproductive effects associated with exposure to selenium. There might be more immediate receiving waters whose pollutant levels result in elevated reproductive risk because they contain other pollutants at concentrations that are harmful to wildlife.

For more information on the potential environmental impacts from selenium exposure, refer to the selenium discussion in Section 3.1. For more detailed information on baseline modeled fish tissue concentrations in the immediate receiving water for selenium and other pollutants evaluated in the EA, see Figures H-11 to H-21 and Tables H-12 to H-22 in Appendix H.

6.2.3 Impacts to Benthic Organisms

EPA also assessed the potential impact to wildlife exposed to sediments in surface waters that receive discharges of the evaluated wastestreams by comparing estimated pollutant concentrations in the sediment to chemical stressor concentration limit (CSCL) benchmarks for sediment biota published by MacDonald, *et. al.* (2000) in *Archives of Environmental Contamination and Toxicology*. Table 6-4 presents the number and percentage of immediate receiving waters with sediment pollutant concentrations that exceed a CSCL. EPA calculated that 22 percent of rivers and streams (40 out of 183) and 35 percent of lakes, ponds, and reservoirs (9 out of 26) had estimated sediment pollutant concentrations that may be toxic to wildlife.

Benthic organisms are at risk primarily due to exposure to mercury, nickel, and cadmium. Estimated sediment pollutant concentrations in 13 to 23 percent of the immediate receiving waters (27 to 49 out of 209) exceed the sediment biota CSCL benchmarks for exposure to cadmium-contaminated, nickel-contaminated, and mercury-contaminated waters. Therefore, benthic organisms inhabiting these waters are under a greater threat for sublethal effects such as skeletal malformation and reduced growth and reproductive success. For more information on these impacts, refer to Section 3.1.1.

As expected, based on documented environmental impacts, modeling results indicate that pollutant concentrations in the benthic sediment in lakes, ponds and reservoirs are more likely to exceed the sediment biota CSCL benchmarks than pollutant concentrations in the benthic sediment of rivers and streams. Several publications in the literature confirm that sediment impacts are more likely to occur in lakes where pollutants can accumulate in sediments over time [Hopkins *et al*., 2000, 2003; Lemly, 1997a].

Table 6-4. Number and Percentage of Immediate Receiving Waters with Sediment Pollutant Concentrations Exceeding CSCLs for Sediment Biota at Baseline

Pollutant	Sediment Benchmark (mg/kg)	Number of Immediate Receiving Waters Exceeding CSCLs for Sediment Biota			
		Rivers and Streams	Lakes, Ponds, and Reservoirs	Total Immediate Receiving Waters	
				Number [a]	Percent
Arsenic	5.90	7	0	7	3%
Cadmium	0.596	22	5	27	13%
Chromium VI [b]	37.3	0	0	0	0%
Copper	35.7	6	1	7	3%
Lead	35	5	1	6	3%
Mercury	0.174	40	9	49	23%
Nickel	18.0	29	5	34	16%
Selenium	ID	NC	NC	NC	NC
Thallium	ID	NC	NC	NC	NC
Zinc	123	14	1	15	7%
Total Number of Unique Immediate Receiving Waters		**40**	**9**	**49**	**23%**

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: CSCL (Chemical stressor concentration limit); ID (Insufficient data; no benchmarks were identified); NC (Not calculated).a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – No benchmark for chromium VI. EPA used the total chromium benchmark, which may underestimate the impact to wildlife.

6.3 HUMAN HEALTH IMPACTS

In addition to assessing water quality impacts on human health as discussed in Section 3.3.2, EPA expanded the analysis to evaluate human health impacts from consuming fish in immediate receiving waters downstream from discharges of the evaluated wastestreams. The purpose of this analysis was to evaluate the broader bioaccumulative effects of pollutants in steam electric power plant discharges to see whether average daily doses of pollutants from fish consumption could potentially exceed human health thresholds where water concentrations may not indicate an issue. EPA evaluated multiple human cohorts (*i.e.*, recreational and subsistence fishers, children and adults) by calculating the average daily dose of pollutants from fish consumption using the estimated fish tissue concentrations calculated in the model. EPA varied the fish consumption rate of each cohort (based on age) to determine the average and long-term daily doses for each pollutant. EPA calculated the lifetime excess cancer risk (LECR) based on

estimated fish tissue concentrations of inorganic arsenic and calculated non-cancer threats by comparing the average daily doses to threshold values for all pollutants with published reference doses. EPA first evaluated human health impacts based on type of fisher and age of cohort using national-level consumption rates. For the environmental justice analysis, EPA determined fish consumption rates using the race population in addition to the other two factors. For more information on how EPA identified potential impacts to human receptors, see Section 5.1.3 and Appendix E.

The human health module presents the risk results for each age group individually to allow for further manipulation in the benefits analysis. The true cancer risk to a child would depend on the amount of time the child consumed fish from locations downstream from steam electric power plant discharges. For example, the cancer risk for a 6-year-old child who was born and raised in the same place would be the sum of the LECRs from the 1 to <2 years, 2 to <3 years, and 3 to <6 years cohort groups.

A limitation of the national-scale IRW modeling that may underestimate the cancer risk is the use of an average annual pollutant loading rate as the basis for the risk estimation; as described earlier, the model does not consider the potential for pollutants to accumulate over time in the environment. The model estimates a minimal cancer risk from consuming fish in lakes, ponds, and reservoirs that receive discharges of the evaluated wastestreams. The cancer risk is likely greater in a lake, where fish are limited in their food sources and can bioaccumulate pollutants over a longer exposure period than is represented in the model.

6.3.1 National-Scale Cohort Analysis

Table 6-5 presents the number and percentage of immediate receiving waters where the estimated LECR for the national-scale human receptor exceeds the selected threshold, 1-in-a-million cancer risk for arsenic. Inorganic arsenic concentrations in fish result in an estimated cancer risk greater than 1-in-a-million to adult subsistence fishers in approximately 12 percent of the immediate receiving waters (25 out of 209) and to adult recreational fishers in approximately 6 percent of the immediate receiving waters (12 out of 209). Cancer risks for the child cohorts are lower, with LECRs exceeding the cancer risk threshold in 2 to 4 percent of the immediate receiving waters. Even given the limitations of the modeling framework discussed in Section 6.3, the inorganic arsenic concentrations in fish can pose a cancer risk to adult subsistence fishers in 12 percent of the lakes and to adult recreational fishers in 8 percent of the lakes.

Table 6-5. Number and Percentage of Immediate Receiving Waters That Exceed Human Health Evaluation Criteria (Lifetime Excess Cancer Risk) for Inorganic Arsenic at Baseline

Receptor	Cohort	Exposure Duration (Years)	Number of Immediate Receiving Waters Where Lifetime Excess Cancer Risk Exceeds 1-in-a-Million [a,b]			
			Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Receiving Waters [c]	
					Number Exceeding	Percentage Exceeding
Child recreational fisher	1 to <2 years	1	4	0	4	2%
	2 to <3 years	1	4	0	4	2%
	3 to <6 years	3	6	0	6	3%
	6 to <11 years	5	6	0	6	3%
	11 to <16 years	5	6	0	6	3%
	16 to <21 years	5	6	0	6	3%
Adult recreational fisher		49	10	2	12	6%
Child subsistence fisher	1 to <2 years	1	6	0	6	3%
	2 to <3 years	1	6	0	6	3%
	3 to <6 years	3	7	0	7	3%
	6 to <11 years	5	8	1	9	4%
	11 to <16 years	5	6	0	6	3%
	16 to <21 years	5	6	0	6	3%
Adult subsistence fisher		49	22	3	25	12%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – Inorganic arsenic cancer slope factor of 1.5 per milligrams per kilogram (mg/kg) per day.

c – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

Based on the estimated fish tissue concentrations and average daily pollutant doses by cohort, subsistence fishers (adults and children) have the greatest threat for non-cancer health effects. This is because the average daily doses (for one or more pollutant) exceed the oral reference dose values in 49 to 56 percent of the immediate receiving waters, depending on the age group evaluated. Recreational fishers (adult or child) have less of a threat, with average daily doses exceeding oral reference doses in 41 to 48 percent of the immediate receiving waters. These results suggest that fish downstream from discharges of the evaluated wastestreams pose a non-cancer health threat to surrounding fisher populations. Given the modeling limitations described above, these results may underestimate these non-cancer health impacts.

Table 6-6 presents the number and percentage of immediate receiving waters where the average daily dose of one or more pollutant exceeds an oral reference dose for non-carcinogens.

Table 6-6. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values at Baseline

			Number of Immediate Receiving Waters where Estimated Exposure Doses Exceed Non-Cancer Reference Doses [a]			
					Total Receiving Waters [b]	
Receptor	**Cohort**	**Exposure Duration (Years)**	**Number of Rivers and Streams**	**Number of Lakes, Ponds, and Reservoirs**	**Number Exceeding**	**Percentage Exceeding**
Child recreational fisher	1 to <2 years	1	82	18	100	48%
	2 to <3 years	1	82	18	100	48%
	3 to <6 years	3	80	18	98	47%
	6 to <11 years	5	76	16	92	44%
	11 to <16 years	5	72	14	86	41%
	16 to <21 years	5	72	14	86	41%
Adult recreational fisher		49	72	14	86	41%
Child subsistence fisher	1 to <2 years	1	98	20	118	56%
	2 to <3 years	1	98	20	118	56%
	3 to <6 years	3	92	19	111	53%
	6 to <11 years	5	87	19	106	51%
	11 to <16 years	5	84	18	102	49%
	16 to <21 years	5	84	18	102	49%
Adult subsistence fisher		49	85	18	103	49%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

According to the exposure doses calculated from the estimated fish tissue concentrations, methylmercury poses the greatest threat to cause non-cancer health effects in humans from fish consumption. Mercury concentrations in fish pose a non-cancer threat to humans in approximately 52 percent of the immediate receiving waters. Therefore, humans who consume fish inhabiting these waters are at risk for developing mercury-related effects, which could include neurological symptoms (*e.g.*, affecting fine motor function, language skills, verbal memory) and cardiovascular disease if exposed at high enough doses. In addition, thallium concentrations in fish pose a non-cancer threat to humans in approximately 45 percent of immediate receiving waters.[45] Therefore, humans who consume thallium-contaminated fish inhabiting these waters are more likely to develop neurological symptoms (*e.g.*, weakness, sleep disorders, muscular problems), alopecia (*i.e.*, loss of hair from the head and body), and gastrointestinal effects (*e.g.*, diarrhea and vomiting).

Table 6-7 presents the number and percentage of immediate receiving waters where average daily doses exceed an oral reference dose for non-carcinogens by pollutant.

[45] EPA used the chronic oral exposure value cited in U.S. EPA, 2010a for thallium chloride as the reference dose.

Table 6-7. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values at Baseline by Pollutant

Pollutant	Oral Reference Dose (mg/kg/day)	Number of Immediate Receiving Waters where Estimated Exposure Doses Exceed Non-Cancer Reference Doses [a]	
		Number Exceeding	Percentage Exceeding
Inorganic arsenic	0.0003 [b]	3	1%
Cadmium	0.001 [b]	32	15%
Chromium VI	0.003 [b]	0	0%
Copper	0.01 [c]	6	3%
Lead	ID	NC	NC
Mercury (as methylmercury)	0.0001 [b]	109	52%
Nickel (soluble salts)	0.02 [b]	0	0%
Selenium	0.005 [b]	55	26%
Thallium (soluble salts)	0.00001 [d]	94	45%
Zinc	0.3 [b]	9	4%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: NC (Not calculated); ID (Insufficient data; there is no current reference dose for lead).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – U.S. EPA, 2011c.

c – ATSDR, 2010a.

d – U.S. EPA, 2010a.

States, territories, and authorized tribes have the primary responsibility to protect residents from the health risks of consuming contaminated noncommercially caught fish. They inform the general population, including recreational and subsistence fishers, typically by issuing advisories that notify the public that chemical contamination found in local fish may present a public health hazard.

EPA modeled concentrations in T4 fish tissue and compared them to fish consumption advisory screening values to assess the potential for discharges of the evaluated wastestreams to cause or contribute to fish advisories and pose a human health hazard. Based on the modeling results, up to 48 percent of the immediate receiving waters evaluated may contain fish with contamination levels that could trigger advisories for recreational and subsistence fishers. Mercury and selenium are the pollutants most likely to exceed screening values. This result indicates that steam electric power plants are contributing to the already widespread concentrations of mercury and selenium in fish throughout the country.

Table 6-8 presents the number and percentage of immediate receiving waters where the modeled T4 fish tissue concentrations exceed screening values used for fish advisories.

Table 6-8. Comparison of T4 Fish Tissue Concentrations at Baseline to Fish Advisory Screening Values

Pollutant	Recreational Fishers			Subsistence Fishers		
	Screening Value (ppm)[a]	Number Exceeding [b]	Percentage Exceeding	Screening Value (ppm) [a]	Number Exceeding [b]	Percentage Exceeding
Inorganic arsenic (noncarcinogen)	1.2	0	0%	0.147	3	1%
Inorganic arsenic (carcinogen)	0.026	4	2%	0.00327	9	4%
Cadmium	4.0	8	4%	0.491	22	11%
Mercury (as methylmercury)	0.4	76	36%	0.049	101	48%
Selenium	20	22	11%	2.457	46	22%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: ppm (parts per million).

a – Screening values are defined as concentrations of target analytes in fish or shellfish tissue that are of potential public health concern and that are used as threshold values against which levels of contamination in similar tissue collected from the ambient environment can be compared. Exceedance of these screening values indicates that more intensive site-specific monitoring and/or evaluation of human health risk should be conducted [U.S. EPA, 2000a, Table 5-3].

b – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

6.3.2 Environmental Justice Analysis

As part of the EA, EPA evaluated whether the impacts from steam electric power plant wastewater discharges disproportionately impact minority groups. This environmental justice (EJ) analysis included looking at impacts based on race or Hispanic origin. Table 6-9 presents the number and percentage of immediate receiving waters where the estimated LECR for the human receptor exceeds the selected threshold, 1-in-a-million cancer risk for arsenic. Inorganic arsenic concentrations in fish result in an estimated cancer risk greater than 1-in-a-million to adult subsistence, minority fishers in approximately 12 to 15 percent of the immediate receiving waters (26 to 32 out of 209) and to adult recreational fishers in approximately 7 to 9 percent of the immediate receiving waters (14 to 19 out of 209). Cancer risks for the child cohorts are lower. The estimated cancer risk among adult minority fishers is higher than the risk among adult nonminority fishers (especially among the recreational fisher population).

Table 6-9. Number and Percentage of Immediate Receiving Waters That Exceed Human Health Evaluation Criteria (Lifetime Excess Cancer Risk) for Inorganic Arsenic at Baseline, by Race or Hispanic Origin

Receptor	Race or Hispanic Origin	Number of Immediate Receiving Waters Where Lifetime Excess Cancer Risk Exceeds 1-in-a-Million [a,b]						
		1 to <2 years	2 to <3 years	3 to <6 years	6 to <11 years	11 to <16 years	16 to <21 years	Adult
Recreational	Non-Hispanic White	3	3	4	6	6	6	12
	Non-Hispanic Black	3	3	5	6	6	6	14
	Mexican-American	4	4	6	6	6	6	18
	Other Hispanic	4	4	6	6	6	6	16
	Other, including Multiple Races	4	4	6	6	6	6	19
Subsistence	Non-Hispanic White	4	4	6	7	7	7	25
	Non-Hispanic Black	5	5	6	7	7	7	26
	Mexican-American	6	6	6	8	8	8	28
	Other Hispanic	6	6	6	7	7	7	28
	Other, including Multiple Races	6	6	7	10	10	10	32

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – Inorganic arsenic cancer slope factor of 1.5 per milligrams per kilogram (mg/kg) per day.

Based on the estimated fish tissue concentrations and average daily pollutant doses by cohort, subsistence fishers (adults and children) have the greatest threat for non-cancer health effects. This is because the average daily doses (for one or more pollutant) exceed the oral reference dose values in 49 to 56 percent of the immediate receiving waters, depending on the age group evaluated. Recreational fishers (adult or child) have less of a threat, with average daily doses exceeding oral reference doses in 41 to 48 percent of the immediate receiving waters. These results suggest that fish downstream from discharges of the evaluated wastestreams pose a non-cancer health threat to surrounding fisher populations. Given the modeling limitations described above, these results may underestimate these non-cancer health impacts.

Table 6-10 presents the number and percentage of immediate receiving waters where the average daily dose of one or more pollutant exceeds an oral reference dose for non-carcinogens.

Table 6-10. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values at Baseline, by Race or Hispanic Origin

Receptor	Race or Hispanic Origin	Number of Immediate Receiving Waters Where Pollutant Exceeds a Non-Cancer Reference Dose [a]						
		Inorganic Arsenic	Cadmium	Copper	Mercury [b]	Selenium	Thallium [c]	Zinc
Recreational, Child Fisher	Non-Hispanic White	0 (0%)	10 (5%)	3 (1%)	81 (39%)	32 (15%)	55 (26%)	4 (2%)
	Non-Hispanic Black	0 (0%)	12 (6%)	4 (2%)	84 (40%)	33 (16%)	58 (28%)	4 (2%)
	Mexican-American	0 (0%)	14 (7%)	4 (2%)	86 (41%)	33 (16%)	63 (30%)	4 (2%)
	Other Hispanic	0 (0%)	13 (6%)	4 (2%)	84 (40%)	33 (16%)	60 (29%)	4 (2%)
	Other, including Multiple Races	0 (0%)	14 (7%)	4 (2%)	88 (42%)	34 (16%)	63 (30%)	4 (2%)
Subsistence, Child Fisher	Non-Hispanic White	3 (1%)	21 (10%)	5 (2%)	98 (47%)	42 (20%)	76 (36%)	5 (2%)
	Non-Hispanic Black	3 (1%)	22 (11%)	5 (2%)	98 (47%)	43 (21%)	78 (37%)	5 (2%)
	Mexican-American	3 (1%)	25 (12%)	6 (3%)	100 (48%)	46 (22%)	79 (38%)	6 (3%)
	Other Hispanic	3 (1%)	25 (12%)	5 (2%)	100 (48%)	46 (22%)	79 (38%)	6 (3%)
	Other, including Multiple Races	3 (1%)	29 (14%)	6 (3%)	104 (50%)	48 (23%)	89 (43%)	6 (3%)
Recreational, Adult Fisher	Non-Hispanic White	0 (0%)	10 (5%)	3 (1%)	81 (39%)	32 (15%)	55 (26%)	4 (2%)
	Non-Hispanic Black	0 (0%)	12 (6%)	4 (2%)	84 (40%)	33 (16%)	58 (28%)	4 (2%)
	Mexican-American	0 (0%)	14 (7%)	4 (2%)	86 (41%)	33 (16%)	63 (30%)	4 (2%)
	Other Hispanic	0 (0%)	13 (6%)	4 (2%)	84 (40%)	33 (16%)	60 (29%)	4 (2%)
	Other, including Multiple Races	0 (0%)	14 (7%)	4 (2%)	88 (42%)	34 (16%)	63 (30%)	4 (2%)
Subsistence, Adult Fisher	Non-Hispanic White	3 (1%)	21 (10%)	5 (2%)	98 (47%)	42 (20%)	76 (36%)	5 (2%)
	Non-Hispanic Black	3 (1%)	22 (11%)	5 (2%)	98 (47%)	43 (21%)	78 (37%)	5 (2%)
	Mexican-American	3 (1%)	25 (12%)	6 (3%)	100 (48%)	46 (22%)	79 (38%)	6 (3%)
	Other Hispanic	3 (1%)	25 (12%)	5 (2%)	100 (48%)	46 (22%)	79 (38%)	6 (3%)
	Other, including Multiple Races	3 (1%)	29 (14%)	6 (3%)	104 (50%)	48 (23%)	89 (43%)	6 (3%)

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – Mercury, as methylmercury.

c – Reference dose based on thallium (soluble salts).

SECTION 7 ENVIRONMENTAL IMPROVEMENTS UNDER THE FINAL RULE

In Section 6, EPA presented the environmental impacts to surface water quality, wildlife, and human health estimated with EPA's immediate receiving water (IRW) model and ecological risk model resulting from baseline discharges of the evaluated wastestreams. Under the final steam electric effluent limitations guidelines and standards (ELGs), EPA evaluated six regulatory options (Options A, B, C, D, E, and F). As part of this quantitative environmental assessment (EA), EPA evaluated the environmental improvements associated with the reduction in pollutant loadings from the evaluated wastestreams (*i.e.*, flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, and combustion residual leachate) under Options A, B, C, D, and E, described in Table 7-1.[46]

In the remainder of this document, EPA presents the results only for Options A through E for existing sources. During development of the final rule, EPA decided not to base the final rule on Option F for existing sources due primarily to the high cost of that Option, particularly in light of the costs associated with other rulemakings expected to impact the steam electric industry (see Section VIII.C.1 of the preamble). As a result, EPA chose not to conduct particular analyses for Option F to the same extent that it did for some of the other options considered. Section 8 of the Technical Development Document (TDD) (EPA-821-R-15-007) details the technology options for all wastestreams evaluated under each regulatory option for the final rule. As described in Section 8 of the TDD, EPA selected Option D as the technology basis for the best available technology economically achievable (BAT) and for pretreatment standards for existing sources (PSES). See Section 12 of the TDD for further information on the limitations and standards of the final rule. This section presents the improvements to surface water quality, wildlife, and human health under the final rule as quantified by EPA's IRW model and ecological risk model.

Based on the quantitative and qualitative analyses performed for the EA, EPA estimated that a variety of environmental improvements would result from the pollutant loading removals associated with the regulatory options. In particular, the EA evaluated the following: 1) improvements in water quality, 2) reduction in threats to wildlife, 3) reduction in human health cancer risks, 4) reduction in threats for non-cancer human health effects, and 5) other unquantified environmental improvements. Table 7-2 lists the quantified and unquantified environmental improvements estimated to result from the final rule's regulatory options and designates which quantified improvements were monetized in the benefits analysis described in the Benefits and Cost Analysis (EPA-821-R-15-005).

[46] In addition to the wastestreams listed in Table 7-1, EPA evaluated technology options associated with flue gas mercury control (FGMC) wastewater, gasification wastewater, and nonchemical metal cleaning wastes as part of the regulatory options. However, no plants currently discharge FGMC wastewater, all existing gasification plants are operating the technology used as the basis for the regulatory option, and EPA will continue to reserve BAT/NSPS/PSES/PSNS for nonchemical metal cleaning wastes, as previously established regulations do. Therefore, EPA estimated zero compliance costs and zero pollutant reductions associated with these wastestreams and did not include these three wastestreams in the EA.

Table 7-1. Regulatory Options for the Wastestreams Evaluated in the EA

Evaluated Wastestream [a]	Option A	Option B	Option C	Option D	Option E
FGD wastewater	Chemical precipitation	Chemical precipitation + biological treatment	Chemical precipitation + biological treatment	Chemical precipitation + biological treatment	Chemical precipitation + biological treatment
Fly ash transport water	Dry handling	Dry handling	Dry handling	Dry handling	Dry handling
Bottom ash transport water	Impoundment (equal to BPT)	Impoundment (equal to BPT)	Dry handling/ closed loop (for units >400 MW); impoundment (equal to BPT) for units ≤400 MW	Dry handling/ closed loop	Dry handling/ closed loop
Combustion residual leachate	Impoundment (equal to BPT)	Impoundment (equal to BPT)	Impoundment (equal to BPT)	Impoundment (equal to BPT)	Chemical precipitation

Acronyms: BPT (Best practicable control technology currently available); MW (Megawatt).

a – The evaluated wastestreams and regulatory options listed in the table are a subset of regulatory options for the steam electric ELGs. See Section 8 of the TDD for the full list of regulatory options.

Table 7-2. Description of Environmental Improvements Associated with the Final Rule

Assessment Category	Description of Environmental Improvement	Improvement Quantified	Improvement Monetized	More Information
Water Quality	Reduced number of immediate receiving waters exceeding an acute or chronic aquatic life NRWQC	✓		Section 7.2 Section 7.3
	Reduced number of immediate receiving waters exceeding a human health NRWQC	✓		Section 7.2 Section 7.3
	Reduced number of immediate receiving waters exceeding MCLs	✓		Section 7.2 Section 7.3
	Increased aesthetic benefits, such as enhancement of adjoining site amenities (*e.g.*, residing, working, traveling, and owning property near water)	✓	✓	Benefits and Cost Analysis [a]
	Improved water-based recreation, including swimming, fishing, boating, and near-water activities from improved water quality	✓	✓	Benefits and Cost Analysis [a]
	Improved quality of source water used for drinking, irrigation, and industrial use			Qualitative Discussion (Benefits and Cost Analysis)
	Increased property values from water quality improvements			Qualitative Discussion (Benefits and Cost Analysis)
	Increased tourism and participation in water-based recreation			Qualitative Discussion (Benefits and Cost Analysis)
	Pollutant removals to impaired waters	✓		Section 7.4
	Pollutant removals to the Great Lakes and Chesapeake Bay	✓		Section 7.5
	Pollutant removals of toxic contaminants, chlorides, and TDS to receiving waters	✓		Section 7.1
	Nutrient removals to receiving waters	✓	✓	Section 7.1 and Benefits and Cost Analysis [a]
	Reduced risk of surface impoundment failures	✓	✓	Benefits and Cost Analysis [a]
	Reduced sediment contamination			Qualitative Discussion (Benefits and Cost Analysis)
	Increased availability of ground water resources	✓	✓	Benefits and Cost Analysis [a]

Table 7-2. Description of Environmental Improvements Associated with the Final Rule

Assessment Category	Description of Environmental Improvement	Improvement Quantified	Improvement Monetized	More Information
Wildlife	Reduced exposure among minks to pollutants that bioaccumulate in fish	✓		Section 7.2 Section 7.3
	Reduced exposure among eagles to pollutants that bioaccumulate in fish	✓		Section 7.2 Section 7.3
	Reduced selenium concentrations in fish and waterfowl and associated reduced reproductive risk	✓		Section 7.2 Section 7.3
	Improved aquatic and wildlife habitat and improved protection of threatened and endangered species	✓	✓	Section 7.4 and Benefits and Cost Analysis [a]
	Improved commercial fisheries yield due to aquatic habitat improvement			Qualitative Discussion (Benefits and Cost Analysis)
	Enhanced existence, option, and bequest values from improved ecosystem health	✓	✓	Benefits and Cost Analysis [a]
	Reduced risks to aquatic life from exposure to steam electric pollutants		✓	Benefits and Cost Analysis [a]
	Reduced exposure to pollutants associated with the wastestreams of concern in surface impoundments that serve as attractive nuisances			Qualitative Discussion (Section 7.7)
Human Health	Reduced exposure to non-cancer pollutants for recreational and subsistence fishers	✓		Section 7.2 Section 7.3 Benefits and Cost Analysis [a]
	Reduced cancer risk in recreational and subsistence fishers	✓	✓	Section 7.2 Section 7.3 Benefits and Cost Analysis [a]
	Reduced incidences of cardiovascular disease from reduced arsenic and lead exposure	✓	✓	Benefits and Cost Analysis [a]
	Reduced adverse health effects from reduced in-utero mercury exposure from maternal fish consumption	✓	✓	Benefits and Cost Analysis [a]
	Reduced IQ loss and specialized education from reduced childhood exposure to lead from fish consumption	✓	✓	Benefits and Cost Analysis [a]
	Reduced adult mortality from air pollutant emissions	✓	✓	Benefits and Cost Analysis [a]
	Avoided climate change impacts from carbon dioxide emissions	✓	✓	Benefits and Cost Analysis [a]
	Reduced exposure to pollutants from recreational water uses			Qualitative Discussion (Benefits and Cost Analysis)

Table 7-2. Description of Environmental Improvements Associated with the Final Rule

Assessment Category	Description of Environmental Improvement	Improvement Quantified	Improvement Monetized	More Information
	Reduced injury associated with impoundment failures			Qualitative Discussion (Benefits and Cost Analysis)
	Reduced number of immediate receiving waters exceeding fish consumption advisory screening values	✓		Section 7.4

Acronyms: MCL (maximum contaminant level); NRWQC (National Recommended Water Quality Criteria); TDS (total dissolved solids).

a – The Benefits and Cost Analysis quantifies and monetizes individual environmental improvements for Options A, B, C, D, and E. See Benefits and Cost Analysis for more detail.

7.1 POLLUTANT REMOVALS UNDER THE REGULATORY OPTIONS

EPA estimates that the regulatory options would significantly reduce pollutant loadings to receiving waters for the 10 pollutants modeled in the EA and for other pollutants that can adversely affect surface waters, such as boron, manganese, nutrients, chlorides, and TDS. Table 7-3 and Table 7-4 present the pollutant removals under the regulatory options for the evaluated wastestreams.

Under the final rule (Option D), EPA estimates that pollutant loadings from existing sources will decrease by over 95 percent for copper, lead, mercury, nickel, selenium, thallium, and zinc and over 90 percent for arsenic and cadmium. In turn, these pollutant removals will reduce the negative impacts on the environment as well as the potential exposure of these contaminants to ecological and human receptors. The selenium removals will significantly improve the water quality around the steam electric power plant discharge locations. Mercury removals will improve human health as mercury has been linked to decreased IQs in children whose pregnant mothers have been exposed to mercury by consuming fish.

Manganese and boron, while not generally considered toxic at levels seen in the aquatic environment, have the highest and third highest toxic-weighted pound equivalents (TWPEs), respectively, under baseline conditions for pollutants evaluated in the EA (see Section 3.2). As discussed in Section 3, boron can negatively impact fish and ducks and manganese can be toxic to humans at high levels. Under the final rule, the pollutant loadings for manganese and boron will decrease by 80 and 15 percent, respectively.

As discussed in Section 3, nutrients (*i.e.*, nitrogen and phosphorus) in excess quantities can adversely affect surface waters by causing oxygen-consuming harmful algae blooms and creating "dead zones" where fish and shellfish cannot survive. Under the final rule, EPA calculated that nitrogen loadings will decrease by 16.8 million pounds per year (99 percent) and phosphorus loadings will decrease by 174,000 pounds per year (81 percent). The nutrient removals will improve hypoxic areas (*i.e.*, low-oxygen surface waters) such as the Chesapeake Bay and the Gulf of Mexico (via reduced loadings to the Mississippi River Basin).

Excess chlorides levels in wastewater discharges can be harmful to animals and plants in nonmarine surface waters and can disrupt ecosystem structure. Under the final rule, annual chlorides loadings to surface waters will decrease by 21.8 million pounds (two percent).

The pollutant parameter, TDS, comprises dissolved solids such as chloride and metals. Under the final rule, EPA calculated that annual TDS loadings to surface waters will decrease by more than 1.32 billion pounds (31 percent). This decrease is at least partially due to the reduction in total and dissolved metals discharged to receiving waters.[47]

[47] EPA's estimated TDS removals do not account for additional removals that may be achieved as a result of steam electric power plants opting to participate in the voluntary incentives program, in which they would be subject to effluent limitations based on evaporation technology, including for TDS.

Table 7-3. Steam Electric Power Generating Industry Pollutant Removals for Metals, Bioaccumulative Pollutants, Nutrients, Chlorides, and TDS Under Regulatory Options

Pollutant	Pollutant Removals, lbs/yr (Percent Reduction) [a]				
	Option A	Option B	Option C	Option D	Option E
Arsenic	15,700 (53%)	15,700 (53%)	23,200 (78%)	27,900 (94%)	28,500 (96%)
Boron	4,230,000 (14%)	4,230,000 (14%)	4,480,000 (14%)	4,630,000 (15%)	4,630,000 (15%)
Cadmium	9,020 (68%)	9,020 (68%)	11,200 (84%)	12,500 (94%)	12,600 (95%)
Chromium VI	131 (84%)	131 (84%)	147 (95%)	156 (>99%)	156 (>99%)
Copper	14,300 (46%)	14,300 (46%)	24,300 (78%)	30,500 (98%)	30,600 (98%)
Lead	7,670 (39%)	7,670 (39%)	14,800 (75%)	19,200 (98%)	19,200 (98%)
Manganese	5,120,000 (68%)	5,120,000 (68%)	5,650,000 (75%)	5,990,000 (80%)	5,990,000 (80%)
Mercury	858 (58%)	868 (58%)	1,230 (83%)	1,450 (97%)	1,470 (99%)
Nickel	62,300 (52%)	62,600 (52%)	96,200 (80%)	117,000 (98%)	118,000 (99%)
Selenium	29,300 (21%)	130,000 (93%)	134,000 (96%)	136,000 (97%)	136,000 (97%)
Thallium	7,180 (11%)	7,180 (11%)	40,900 (64%)	62,300 (98%)	62,300 (98%)
Zinc	120,000 (69%)	120,000 (69%)	148,000 (85%)	166,000 (95%)	169,000 (97%)
Nitrogen, total [b]	1,980,000 (12%)	12,300,000 (73%)	15,100,000 (89%)	16,800,000 (99%)	16,800,000 (99%)
Phosphorus, total	43,100 (20%)	43,100 (20%)	123,000 (57%)	174,000 (81%)	174,000 (81%)
Chlorides	4,160,000 (<1%)	4,160,000 (<1%)	14,900,000 (2%)	21,800,000 (2%)	21,800,000 (2%)
TDS	849,000,000 (20%)	849,000,000 (20%)	1,130,000,000 (27%)	1,320,000,000 (31%)	1,320,000,000 (31%)

Source: ERG, 2015a.

Acronyms: TDS (Total Dissolved Solids); lbs/yr (pounds per year).

Note: Pollutant removals are rounded to three significant figures.

a – .>0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

Table 7-4. Steam Electric Power Generating Industry TWPE Removals for Metals, Bioaccumulative Pollutants, Nutrients, Chlorides, and TDS Under Regulatory Options

Pollutant	Pollutant Removals, TWPE/year (Percent Reduction) [a]				
	Option A	**Option B**	**Option C**	**Option D**	**Option E**
Arsenic	54,600 (53%)	54,600 (53%)	80,400 (78%)	96,700 (94%)	98,900 (96%)
Boron	35,300 (13%)	35,300 (13%)	37,300 (14%)	38,600 (15%)	38,600 (15%)
Cadmium	205,000 (68%)	205,000 (68%)	254,000 (84%)	285,000 (94%)	287,000 (95%)
Chromium VI	6\7.5 (84%)	67.5 (84%)	76.1 (94%)	80.4 (>99%)	80.4 (>99%)
Copper	8,890 (46%)	8,890 (46%)	15,100 (78%)	19,000 (98%)	19,100 (98%)
Lead	17,200 (39%)	17,200 (39%)	33,100 (75%)	43,100 (98%)	43,100 (98%)
Manganese	526,000 (68%)	526,000 (68%)	580,000 (75%)	615,000 (80%)	615,000 (80%)
Mercury	94,400 (58%)	95,500 (58%)	136,000 (83%)	160,000 (97%)	162,000 (99%)
Nickel	6,790 (52%)	6,820 (52%)	10,500 (80%)	12,800 (98%)	12,900 (99%)
Selenium	32,900 (21%)	146,000 (93%)	150,000 (96%)	152,000 (97%)	152,000 (97%)
Thallium	20,500 (11%)	20,500 (11%)	117,000 (64%)	178,000 (98%)	178,000 (98%)
Zinc	5,650 (69%)	5,650 (69%)	6,950 (85%)	7,770 (95%)	7,940 (97%)
Nitrogen, total	N/A	N/A	N/A	N/A	N/A
Phosphorus, total	N/A	N/A	N/A	N/A	N/A
Chlorides	101 (<1%)	101 (<1%)	364 (2%)	531 (2%)	531 (2%)
TDS	N/A	N/A	N/A	N/A	N/A

Source: ERG, 2015a.

Acronyms: TDS (Total Dissolved Solids); TWPE (Toxic Weighted Pound Equivalents).

Note: Pollutant removals are rounded to three significant figures.

N/A – The TWPE/year is not provided for total nitrogen, total phosphorus, and TDS because EPA has not established a toxic weighting factor (TWF) for these pollutants.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

7.2 KEY ENVIRONMENTAL IMPROVEMENTS

As part of this EA, EPA conducted modeling of the expected environmental improvements under Options A through E. EPA estimates the environmental improvements under Option F, which were not modeled, to be incrementally greater than those under Option E based on the pollutant reductions calculated.

Table 7-5 summarizes the key environmental improvements within the immediate receiving waters due to the pollutant removals under the final rule (Option D) and other evaluated regulatory options. The numbers of immediate receiving waters with water quality, wildlife, and human health exceedances would:

- Decrease under Options A and B by no more than 33 percent, with most exceedances being reduced by less than 15 percent.
- Decrease under Option C by 17 to 56 percent, with most exceedances being reduced by less than 40 percent.
- Decrease under Option D by 45 to 83 percent, with most exceedances being reduced by at least 56 percent.
- Decrease under Option E by 51 to 84 percent, with most exceedances being reduced by at least 61 percent.

The final rule (Option D) will substantially improve water quality, wildlife, and human health. Under the final rule, EPA estimates that:

- Receiving water exceedances of the NRWQC will decrease by 45 to 67 percent.
- Receiving water exceedances of the MCL benchmarks will decrease by 83 percent.
- The number of receiving waters with fish tissue concentrations exceeding the no effect hazard concentration (NEHC) for selenium for eagles and minks will decrease by 63 and 62 percent, respectively.
- Human exposures via fish consumption to pollutants with the potential to cause non-cancer health effects will decrease by up to 56 percent.
- Human exposures to pollutants that present a cancer risk will decrease by up to 75 percent.

Results for the final rule are discussed in further detail in the sections following Table 7-5.

7.2.1 Improvements in Water Quality Under the Final Rule

EPA estimates that pollutant removals to surface waters associated with the final rule will significantly improve water quality by reducing exceedances of the NRWQC and MCLs by up to 83 percent. The largest reductions in NRWQC exceedances are attributed to reduced loadings of cadmium, selenium, arsenic, and thallium. Due to the substantial pollutant removals, EPA projects that aquatic organisms will be less susceptible to chronic impacts such as:

- Skeletal malformations;
- Organ damage;
- Developmental abnormalities;
- Behavioral impairments;
- Reproductive failure;
- Metabolic failure;
- Neurological effects;
- Gastrointestinal effects; and
- Fish kills.[48]

EPA estimates that up to 45 percent of the 209 evaluated immediate receiving waters currently exceed NRWQC for the protection of human health, primarily due to arsenic and thallium. EPA estimates that these arsenic and thallium removals will lower the number of immediate receiving waters that exceed NRWQC designed to protect public health by 45 to 50 percent. By reducing MCL exceedances by 83 percent, the final rule will improve the quality of source water available to drinking water treatment plants downstream from steam electric power plants.

In addition to reducing NRWQC and MCL exceedances, the final rule will quantifiably improve overall water quality – in the immediate receiving waters and downstream from steam electric power plants. EPA calculates that, on average, receiving water concentrations of the 10 toxic, bioaccumulative pollutants evaluated in the EA will decrease by 57 percent.

[48] Impacts documented in ATSDR, 2008a; Coughlan and Velte, 1989; Lemly, 1985b; Nagle *et al*., 2001; NRC, 2006; Rowe *et al*., 2002; U.S. EPA, 2009a; and U.S. EPA, 2011f.

Table 7-5. Key Environmental Improvements Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	9	4%	6 (33%)	6 (33%)	6 (33%)	3 (67%)	2 (78%)
Freshwater Chronic NRWQC	35	17%	34 (3%)	27 (23%)	21 (40%)	17 (51%)	17 (51%)
Human Health Water and Organism NRWQC	94	45%	90 (4%)	90 (4%)	69 (27%)	52 (45%)	43 (54%)
Human Health Organism Only NRWQC	66	32%	62 (6%)	62 (6%)	46 (30%)	33 (50%)	26 (61%)
Drinking Water MCL	36	17%	34 (6%)	33 (8%)	16 (56%)	6 (83%)	6 (83%)
Wildlife Results							
Fish Ingestion NEHC for Minks	58	28%	57 (2%)	51 (12%)	32 (45%)	22 (62%)	21 (64%)
Fish Ingestion NEHC for Eagles	71	34%	65 (8%)	61 (14%)	44 (38%)	26 (63%)	23 (68%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	100	48	92 (8%)	90 (10%)	68 (32%)	47 (53%)	38 (62%)
Non-Cancer Reference Dose for Adult (recreational)	86	41%	77 (10%)	74 (14%)	56 (35%)	38 (56%)	28 (67%)
Non-Cancer Reference Dose for Child (subsistence)	118	56%	107 (9%)	104 (12%)	79 (33%)	52 (56%)	46 (61%)
Non-Cancer Reference Dose for Adult (subsistence)	103	49%	94 (9%)	93 (10%)	71 (31%)	49 (52%)	39 (62%)

Table 7-5. Key Environmental Improvements Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Human Health Results—Cancer							
Arsenic Cancer Risk for Child (recreational)	6	3%	5 (17%)	5 (17%)	5 (17%)	2 (67%)	2 (67%)
Arsenic Cancer Risk for Adult (recreational)	12	6%	9 (25%)	9 (25%)	6 (50%)	3 (75%)	2 (83%)
Arsenic Cancer Risk for Child (subsistence)	8	4%	7 (13%)	7 (13%)	6 (25%)	3 (63%)	2 (75%)
Arsenic Cancer Risk for Adult (subsistence)	25	12%	23 (8%)	23 (8%)	15 (40%)	11 (56%)	4 (84%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (maximum contaminant level); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

7.2.2 Reduced Threat to Wildlife Under the Final Rule

In the EA, EPA evaluated multiple threats to wildlife, including impacts to wildlife indicator species by consuming contaminated fish; impacts to fish and waterfowl due to dietary exposure to selenium; and exposure of benthic aquatic organisms to contaminated sediments. The combination of lethal and sublethal effects (*e.g.*, changes to morphology, behavior, and metabolism) of exposure to steam electric power plant wastewater can cause cascading effects through the food web.

As discussed in Section 7.2.1, the number of immediate receiving waters that can potentially pose an acute or chronic threat to wildlife will decrease under the final rule, improving wildlife populations and communities surrounding steam electric power plants (*e.g.*, reduced impacts to population density and species diversity as discussed in Section 3). EPA estimates that average fish tissue concentrations of the pollutants evaluated in the EA will decrease by an average of 57 percent. EPA projects that these lower pollutant concentrations will significantly improve the health of fish populations and the quality of fish available for consumption by both humans and wildlife near steam electric power plants.

Based on the threats to minks and eagles from consuming fish contaminated by steam electric power plant wastewater, pollutants can bioaccumulate and impact higher order species in the food chain. Under the final rule, EPA estimates that exceedances of the NEHC for eagles and minks will decrease by approximately 70 percent. See Section 7.3.3 for discussion of the reduced risk of adverse reproductive effects among aquatic wildlife (fish and mallards) resulting from dietary exposure to selenium.

EPA estimates that pollutant removals to surface waters associated with the final rule will decrease the exposure of aquatic organisms to pollutants in the sediment, as shown in Table 7-6. As discussed in Section 6.2.3, benthic organisms are at risk primarily due to exposure to mercury, nickel, and cadmium. Under the final rule, the number of immediate receiving waters with pollutant concentration in the sediment above chemical stressor concentration limits (CSCL) will decrease by over 60 percent.

Table 7-6. Number of Immediate Receiving Waters with Sediment Pollutant Concentrations Exceeding CSCLs for Sediment Biota Under the Regulatory Options

Pollutant	Modeled Immediate Receiving Waters Exceeding CSCLs Under Baseline Conditions [a]	Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
		Option A	Option B	Option C	Option D	Option E
Arsenic	7 (3%)	6 (14%)	6 (14%)	6 (14%)	3 (57%)	2 (71%)
Cadmium	27 (13%)	21 (22%)	21 (22%)	14 (48%)	10 (63%)	8 (70%)
Chromium VI [c]	0 (0%)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Copper	7 (3%)	5 (29%)	5 (29%)	5 (29%)	2 (71%)	2 (71%)
Lead	6 (3%)	4 (33%)	4 (33%)	4 (33%)	1 (83%)	1 (83%)
Mercury	49 (23%)	45 (8%)	44 (10%)	26 (47%)	19 (61%)	7 (86%)
Nickel	34 (16%)	28 (18%)	28 (18%)	16 (53%)	11 (68%)	4 (88%)
Selenium	NC	NC	NC	NC	NC	NC
Thallium	NC	NC	NC	NC	NC	NC
Zinc	15 (7%)	9 (40%)	9 (40%)	9 (40%)	6 (60%)	2 (87%)
Total	**49 (23%)**	**45 (8%)**	**44 (10%)**	**27 (45%)**	**20 (59%)**	**8 (84%)**

Source: ERG, 2015d;ERG, 2015h; ERG, 2015i.

Acronyms: CSCL (Chemical stressor concentration limit); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NC (Not calculated; no benchmark for comparison).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

c – EPA used the total chromium benchmark for this analysis.

7.2.3 Reduced Human Health Cancer Risk Under the Final Rule

Under baseline conditions, EPA estimates that 25 immediate receiving waters (12 percent) could contain fish contaminated with inorganic arsenic that present cancer risks above the 1-in-a-million threshold for the most sensitive, national-scale cohort. EPA calculates that the number of immediate receiving waters whose fish exceed this cancer risk threshold will decrease by at least 56 percent for all national-scale cohorts under the final rule.

7.2.4 Reduced Threat of Non-Cancer Human Health Effects Under the Final Rule

Chronic exposure to toxic, bioaccumulative pollutants in steam electric power plant wastewater can potentially compromise neurological and developmental functions and affect the circulatory, respiratory, and digestive systems of exposed populations. EPA estimates that the number of immediate receiving waters whose fish pose non-cancer health risks will decrease by at least 52 percent for all national-scale cohorts under the final rule. As discussed in Section 7.2.2, EPA found that the pollutant concentrations in fish tissue will decrease, improving the quality of fish available to recreational and subsistence fishers and subsequently lowering exposures to toxic, bioaccumulative pollutants and the potential for humans to develop non-cancer health effects (*e.g.*, nausea, abdominal pain, sleep disorders, muscular problems, and cardiovascular disease).

The pollutants that cause the potential for non-cancer health effects are selenium, cadmium, mercury (as methylmercury), and, to a lesser degree, thallium. EPA calculates that the final rule will decrease the number of immediate receiving waters with fish that, if consumed, would exceed the reference doses for these pollutants, by the following amounts:

- Selenium: decrease by at least 51 percent for all national-scale cohorts.
- Cadmium: decrease by at least 53 percent for all national-scale cohorts.
- Methylmercury: decrease by at least 52 percent for all national-scale cohorts.
- Thallium: decrease by at least 62 percent for all national-scale cohorts.

Although the EA did not directly assess the potential non-cancer health effects posed by lead,[49] the final rule will lower the total annual loadings of lead to the environment by 19,000 pounds (98 percent), thus reducing the potential threat of hypertension, coronary heart disease, and impaired cognitive function in exposed populations. For children in particular, lead exposure can cause additional negative impacts, such as hyperactivity, behavioral and attention difficulties, delayed mental development, and motor and perceptual skill deficits. The benefits to adults and children from the reduced lead discharges are discussed in the Benefits and Cost Analysis.

7.2.5 Reduced Human Health Risk for Environmental Justice Analysis

As discussed in Section 6.3.2, EPA evaluated the impacts that steam electric power plant discharges have on environmental justice (EJ) cohorts in addition to the national-scale cohorts. Under baseline conditions, EPA estimates that 32 immediate receiving waters (15 percent) could

[49] Currently, there is no reference dose for lead—there is no safe level for ingestion of lead (see EPA's Integrated Risk Information System (IRIS) website: http://www.epa.gov/IRIS/).

contain fish contaminated with inorganic arsenic that present cancer risks above the 1-in-a-million threshold for the most sensitive minority cohort. EPA estimates that the number of immediate receiving waters whose fish exceed this cancer risk threshold will decrease by at least 46 percent for the average recreational fisher minority cohort and at least 51 percent for the average subsistence fisher minority cohort under the final rule.[50] These improvements are similar to those for non-minority recreational and subsistence fisher cohorts (at least 33 and 50 percent, respectively) under the final rule.

EPA estimates that the number of immediate receiving waters whose fish pose non-cancer health risks will decrease by 56 percent for all recreational fisher minority cohorts and 53 percent for all subsistence fisher minority cohorts under the final rule. These improvements are similar to those for non-minority recreational and subsistence fisher cohorts (56 and 52 percent, respectively) under the final rule. The pollutants that cause the potential for non-cancer health effects are selenium, cadmium, mercury (as methylmercury), and, to a lesser degree, thallium.

7.3 POLLUTANT-SPECIFIC IMPROVEMENTS

EPA identified several key pollutants (*i.e.*, arsenic, mercury, selenium, cadmium, and thallium) whose pollutant removals would primarily be responsible for the improvements in water quality, wildlife, and human health attributed to the final rule. This section highlights the environmental improvements associated with these five pollutants.

7.3.1 Arsenic

Under the final rule, EPA estimates 27,900 pounds per year of arsenic removals from steam electric power plant discharges – a 94 percent reduction in annual loadings. The final rule will decrease the number of immediate receiving waters exceeding human health NRWQC for arsenic by up to 49 percent. The arsenic removals will reduce negative effects on aquatic organisms, such as liver tissue death, developmental abnormalities, behavioral impairments, metabolic failure, growth reduction, and appetite loss [NRC, 2006; Rowe *et al*., 2002; U.S. EPA, 2011f]. As a result, the final rule will decrease human exposure to arsenic through fish consumption and thus lower the potential for exposed populations to develop arsenic-related cancer and non-cancer health effects such as dermal, cardiovascular, and respiratory effects. The final rule will decrease the number of immediate receiving waters exceeding the human health cancer risk threshold for arsenic by up to 75 percent, depending on the evaluated cohort. Table 7-7 presents the key environmental improvements resulting from arsenic removals under the regulatory options evaluated in the EA.

EPA did not see a reduction in the number of immediate receiving waters exceeding the arsenic NEHCs for minks or eagles because there are no exceedances modeled at baseline. The final rule, however, will still reduce the bioaccumulation of arsenic in the food web.

[50] These values represent the average percentage improvements across the four race populations that comprise the minority cohorts.

Table 7-7. Key Environmental Improvements for Arsenic Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	3	1%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)
Freshwater Chronic NRWQC	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	1 (75%)
Human Health Water and Organism NRWQC	94	45%	90 (4%)	90 (4%)	69 (27%)	52 (45%)	43 (54%)
Human Health Organism Only NRWQC	65	31%	61 (6%)	61 (6%)	45 (31%)	33 (49%)	26 (60%)
Drinking Water MCL	12	6%	9 (25%)	9 (25%)	6 (50%)	3 (75%)	2 (83%)
Wildlife Results							
Fish Ingestion NEHC for Minks	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Fish Ingestion NEHC for Eagles	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	2	1%	1 (50%)	1 (50%)	1 (50%)	1 (50%)	0 (100%)
Non-Cancer Reference Dose for Adult (recreational)	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Non-Cancer Reference Dose for Child (subsistence)	3	1%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)
Non-Cancer Reference Dose for Adult (subsistence)	3	1%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)

Table 7-7. Key Environmental Improvements for Arsenic Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Human Health Results—Cancer							
Arsenic Cancer Risk for Child (recreational)	6	3%	5 (17%)	5 (17%)	5 (17%)	2 (67%)	2 (67%)
Arsenic Cancer Risk for Adult (recreational)	12	6%	9 (25%)	9 (25%)	6 (50%)	3 (75%)	2 (83%)
Arsenic Cancer Risk for Child (subsistence)	8	4%	7 (13%)	7 (13%)	6 (25%)	3 (63%)	2 (75%)
Arsenic Cancer Risk for Adult (subsistence)	25	12%	23 (8%)	23 (8%)	15 (40%)	11 (56%)	4 (84%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

7.3.2 Mercury

Under the final rule, EPA estimates 1,450 pounds per year of mercury removals from steam electric power plant discharges – a 97 percent reduction in annual loadings. As discussed in Section 6.2, estimated fish tissue concentrations for mercury (and selenium) exceed levels that can affect reproduction in exposed mink and eagle populations. EPA estimates that the final rule will decrease the number of immediate receiving waters with fish tissue concentrations that exceed the mercury NEHC for eagles and minks by 62 and 64 percent, respectively. These reductions also represent the potential improvement in exposure to mercury above effects thresholds in other wildlife that consume fish from these receiving waters.

Under baseline pollutant loadings, EPA estimates that fish methylmercury concentrations pose a non-cancer threat to subsistence fishers and recreational fishers in up to 52 and 46 percent, respectively, of immediate receiving waters. EPA calculates that fish tissue concentrations of methylmercury will decrease under the final rule and, as a result, the number of immediate receiving waters with exposure doses from fish consumption that exceed the methylmercury reference dose will decrease by up to 57 percent. Because there are over 80 addressed by this final rule discharge to receiving waters that are under a fish advisory for mercury (see Section 3.4.4), the final rule will reduce mercury loadings to those receiving waters (see Section 7.4). Table 7-8 presents the key environmental improvements resulting from mercury removals under the regulatory options.

Table 7-8. Key Environmental Improvements for Mercury Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	1	0%	0 (100%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)
Freshwater Chronic NRWQC	1	0%	0 (100%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)
Human Health Water and Organism NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Organism Only NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Drinking Water MCL	5	2%	4 (20%)	4 (20%)	4 (20%)	2 (60%)	1 (80%)
Wildlife Results							
Fish Ingestion NEHC for Minks	55	26%	50 (9%)	49 (11%)	30 (45%)	20 (64%)	8 (85%)
Fish Ingestion NEHC for Eagles	71	34%	61 (14%)	61 (14%)	44 (38%)	27 (62%)	18 (75%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	96	46%	87 (9%)	84 (13%)	63 (34%)	44 (54%)	35 (64%)
Non-Cancer Reference Dose for Adult (recreational)	82	39%	71 (13%)	69 (16%)	52 (37%)	35 (57%)	24 (71%)
Non-Cancer Reference Dose for Child (subsistence)	109	52%	97 (11%)	96 (12%)	75 (31%)	52 (52%)	46 (58%)
Non-Cancer Reference Dose for Adult (subsistence)	99	47%	89 (10%)	87 (12%)	66 (33%)	46 (54%)	36 (64%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

7.3.3 <u>Selenium</u>

Under the final rule, EPA estimates 136,000 pounds per year of selenium removals from steam electric power plant discharges – a 97 percent reduction in annual loadings. Selenium is one of the primary pollutants identified in the literature and by EPA as causing documented environmental impacts to fish and wildlife from steam electric power plant discharges. EPA estimates that immediate receiving water concentrations of total selenium will decrease under the final rule by 71 percent on average, decreasing the amount of selenium that would bioaccumulate or persist in the aquatic environment. Under the final rule, the number of immediate receiving waters exceeding chronic aquatic life NRWQC will decrease by 55 percent and the number of immediate receiving waters exceeding a drinking water MCL for selenium will decrease by 75 percent.

Reducing selenium loadings and subsequent bioaccumulation will decrease by 52 percent the number of immediate receiving waters with fish tissue concentrations exceeding the NEHC for selenium for both eagles and minks. These reductions also represent the potential health improvements in other wildlife that consume fish from these receiving waters, as well as the potential decrease in bioaccumulation of toxic pollutants in the broader food web near steam electric power plants.

Selenium is known to cause fish deformities at high levels, such as these from Belews Lake, NC.

The results of the ecological risk model further support these predicted reductions in the bioaccumulative impact of selenium throughout the food web. Under the final rule, the ecological risk modeling results indicate that:

- The risk of negative reproductive impacts among fish and/or mallards will be reduced to less than one percent in each of the 26 modeled lentic immediate receiving waters.
- The number of immediate receiving waters that present a risk of reproductive impacts among at least 10 percent of the exposed population will be reduced by 67 percent (for fish) and 61 percent (for mallards).
- The number of immediate receiving waters that present a risk of reproductive impacts among at least 50 percent of the exposed population will be reduced by 70 percent (for fish) and 74 percent (for mallards).

These results are based on the median modeled egg/ovary selenium concentration in exposed fish and mallards. Use of the 90th percentile modeled egg/ovary concentration, which results in a higher predicted risk of reproductive impacts, shows similar improvements under the final rule:

- The risk of negative reproductive impacts among fish will be reduced to less than one percent in all but one of the 26 modeled lentic immediate receiving waters.
- The number of immediate receiving waters that present a risk of reproductive impacts among at least 10 percent of the exposed population will be reduced by 55 percent (for fish) and 52 percent (for mallards). Under the final rule, none of the lentic immediate receiving waters will pose this reproductive risk to fish or mallards.
- The number of immediate receiving waters that present a risk of reproductive impacts among at least 50 percent of the exposed population will be reduced by 53 percent (for fish) and 59 percent (for mallards).

Under the final rule, EPA estimates that fish selenium concentrations that pose a non-cancer threat to subsistence fishers and recreational fishers will decrease in up to 53 and 56 percent of immediate receiving waters, respectively. This reduces the risk of developing non-cancer health effects associated with selenium, such as pulmonary edema and lesions of the lung; cardiovascular effects such as tachycardia; gastrointestinal effects including nausea, vomiting, diarrhea, and abdominal pain; effects on the liver; and neurological effects such as aches, irritability, chills, and tremors [U.S. EPA, 2000b]. Table 7-9 presents the key environmental improvements resulting from selenium removals under the regulatory options.

Table 7-9. Key Environmental Improvements for Selenium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Freshwater Chronic NRWQC [d]	33	16%	30 (9%)	20 (39%)	18 (45%)	15 (55%)	15 (55%)
Human Health Water and Organism NRWQC	8	4%	7 (13%)	3 (63%)	3 (63%)	2 (75%)	2 (75%)
Human Health Organism Only NRWQC	1	0%	1 (0%)	1 (0%)	1 (0%)	1 (0%)	1 (0%)
Drinking Water MCL	12	6%	10 (17%)	5 (58%)	5 (58%)	3 (75%)	3 (75%)
Wildlife Results							
Fish Ingestion NEHC for Minks	42	20%	40 (5%)	29 (31%)	23 (45%)	20 (52%)	20 (52%)
Fish Ingestion NEHC for Eagles	42	20%	40 (5%)	29 (31%)	23 (45%)	20 (52%)	20 (52%)
Negative Reproductive Effects in Fish [c]	24	11%	19 (21%)	10 (58%)	10 (58%)	8 (67%)	8 (67%)
Negative Reproductive Effects in Mallards [c]	31	15%	26 (16%)	16 (48%)	14 (55%)	12 (61%)	12 (61%)

Table 7-9. Key Environmental Improvements for Selenium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	41	20%	39 (5%)	29 (29%)	23 (44%)	20 (51%)	20 (51%)
Non-Cancer Reference Dose for Adult (recreational)	32	15%	29 (9%)	18 (44%)	17 (47%)	14 (56%)	14 (56%)
Non-Cancer Reference Dose for Child (subsistence)	55	26%	51 (7%)	39 (29%)	33 (40%)	27 (51%)	27 (51%)
Non-Cancer Reference Dose for Adult (subsistence)	43	21%	40 (7%)	30 (30%)	23 (47%)	20 (53%)	20 (53%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

c – These rows indicate the number of immediate receiving waters whose median modeled egg/ovary concentration is predicted to result in reproductive impacts among at least 10 percent of the exposed fish or mallard population, as determined using the ecological risk model.

d – The EA analyses use the EPA recommended water quality criteria for selenium in the water column of 5 µg/L -- in effect at the time of the modeling done, both for the proposed rule in 2012, and the final rule in 2015. EPA used this criterion in its modeling for the final rule to allow for consistent comparisons between the modeling done for the proposed rule and that done for the final rule. All modeling was done prior to EPA publishing new final draft criteria for selenium on July 27, 2015. The new final draft criteria, which EPA now recommends, of 3.1 µg/L in freshwater flowing systems (rivers, streams) and 1.2 µg/L in lakes and reservoirs, are lower than the criteria EPA used in these analyses. Had EPA conducted the modeling with these new recommended criteria, it would have resulted in slightly greater estimated impacts (more exceedances of the new selenium criteria) than that revealed using the old criteria. As a result, this would have led to slightly greater potential improvements due to control of selenium discharges under the final rule. Therefore, the estimates of the modeled selenium impacts, and potential improvements of the final ELG, are conservative and tend, if anything, to underestimate both the impacts and the benefits.

7.3.4 Cadmium

Under the final rule, EPA estimates 9,020 pounds per year of cadmium removals from steam electric power plant discharges – a 68 percent reduction in annual loadings. At baseline conditions, discharges of cadmium are the second largest toxic-weighted pollutant discharges from the steam electric power generating industry among those pollutants evaluated in the EA (see Section 3.2). The final rule will decrease the number of immediate receiving waters that exceed acute and chronic NRWQC by up to 67 and 59 percent, respectively. The number of immediate receiving waters with fish tissue concentrations that exceed NEHCs for minks and eagles will decrease by 67 and 50 percent, respectively. Under the final rule, the number of immediate receiving waters with fish containing cadmium concentrations that pose a risk of non-cancer health effects will decrease by 53 to 70 percent, depending on the cohort. Table 7-10 presents the key environmental improvements resulting from cadmium removals under the regulatory options.

7.3.5 Thallium

Under the final rule, EPA estimates 62,300 pounds per year of thallium removals from steam electric power plant discharges – a 98 percent reduction in annual loadings. EPA estimates that the final rule will decrease the number of immediate receiving waters exceeding human health NRWQC and MCLs for thallium by up to 85 percent. Under the final rule, the number of immediate receiving waters with fish containing thallium concentrations that can potentially cause non-cancer health effects in humans (*e.g.*, neurological symptoms, alopecia, gastrointestinal effects, and reproductive and developmental damage) will decrease by up to 69 percent, depending on the cohort. Table 7-11 presents the key environmental improvements resulting from thallium removals under the regulatory options.

Table 7-10. Key Environmental Improvements for Cadmium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	9	4%	6 (33%)	6 (33%)	6 (33%)	3 (67%)	2 (78%)
Freshwater Chronic NRWQC	29	14%	23 (21%)	23 (21%)	16 (45%)	12 (59%)	9 (69%)
Human Health Water and Organism NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Organism Only NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Drinking Water MCL	11	5%	7 (36%)	7 (36%)	6 (45%)	3 (73%)	2 (82%)
Wildlife Results							
Fish Ingestion NEHC for Minks	6	3%	5 (17%)	5 (17%)	5 (17%)	2 (67%)	2 (67%)
Fish Ingestion NEHC for Eagles	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	2 (50%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	16	8%	12 (25%)	12 (25%)	9 (44%)	5 (69%)	3 (81%)
Non-Cancer Reference Dose for Adult (recreational)	10	5%	7 (30%)	7 (30%)	6 (40%)	3 (70%)	2 (80%)
Non-Cancer Reference Dose for Child (subsistence)	32	15%	26 (19%)	26 (19%)	19 (41%)	15 (53%)	10 (69%)
Non-Cancer Reference Dose for Adult (subsistence)	22	11%	17 (23%)	17 (23%)	11 (50%)	7 (68%)	4 (82%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table 7-11. Key Environmental Improvements for Thallium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Freshwater Chronic NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Water and Organism NRWQC	49	23%	46 (6%)	46 (6%)	27 (45%)	13 (73%)	13 (73%)
Human Health Organism Only NRWQC	45	22%	42 (7%)	42 (7%)	23 (49%)	8 (82%)	8 (82%)
Drinking Water MCL	34	16%	32 (6%)	32 (6%)	15 (56%)	5 (85%)	5 (85%)
Wildlife Results							
Fish Ingestion NEHC for Minks	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Fish Ingestion NEHC for Eagles	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	74	35%	73 (1%)	73 (1%)	46 (38%)	27 (64%)	27 (64%)
Non-Cancer Reference Dose for Adult (recreational)	54	26%	51 (6%)	51 (6%)	31 (43%)	17 (69%)	17 (69%)
Non-Cancer Reference Dose for Child (subsistence)	94	45%	90 (4%)	90 (4%)	63 (33%)	35 (63%)	35 (63%)
Non-Cancer Reference Dose for Adult (subsistence)	77	37%	76 (1%)	76 (1%)	49 (36%)	29 (62%)	29 (62%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The EA encompasses a total of 222 immediate receiving waters and loadings from 195 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 209 immediate receiving waters (183 rivers and streams; 26 lakes, ponds, and reservoirs) and loadings from 188 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

7.4 IMPROVEMENTS TO SENSITIVE ENVIRONMENTS

As discussed in Section 3.4, EPA evaluated pollutant discharges to sensitive environments (*i.e.*, impaired waters, threatened and endangered species, and fish consumption advisory waters) and sensitive watersheds (the Great Lakes and Chesapeake Bay). The purpose was to assess if steam electric power plants discharge to receiving waters with existing impairments or fish advisories and assess if discharges of the evaluated wastestreams increase stress on threatened and endangered species. This section presents EPA's estimated pollutant removals under five regulatory options to the evaluated sensitive environments.

The final rule will decrease pollutant loadings to sensitive environments, which will help impaired waters to recover; decrease the bioaccumulation of toxic pollutants in fish, thereby reducing the number of fish advisories; and reduce stress on threatened and endangered species and sensitive watersheds such as Chesapeake Bay and the Great Lakes (see Section 7.5).

7.4.1 <u>Impaired Waters</u>

EPA determined that 59 of the immediate receiving waters are 303(d)-listed waterbodies, designated as impaired for one or more pollutants found in the evaluated wastestreams.[51] Mercury (30 immediate receiving waters), nutrients (19 immediate receiving waters), and phosphorus (11 immediate receiving waters) are the most frequently identified impairment categories among the surface waters that directly receive the evaluated wastestreams. Table 7-12 presents the pollutant removals to impaired waters (by impairment category) as a result of the regulatory options.

Under the final rule, EPA estimates the following pollutant removals:

- Mercury removals of 168 pounds per year to mercury-impaired waters (decrease of 99 percent).
- Phosphorus removals of 4,100 pounds per year to nutrient-impaired waters (decrease of 78 percent).
- Nitrogen removals of 471,000 pounds per year to nutrient-impaired waters (decrease of 96 percent).
- Pollutant removals to receiving waters impaired for a metal (except mercury) include 4,100 pounds per year of arsenic (decrease of 95 percent); 1,770 pounds per year of cadmium (decrease of 93 percent); 2,630 pounds per year of lead (decrease of 97 percent); 21,500 pounds per year of selenium (decrease of 97 percent); and 7,130 pounds per year of thallium (decrease of 97 percent).[52]

[51] The count of impaired waters excludes the general impairment category "metals (not mercury)" and includes receiving waters impaired for arsenic, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc, phosphorous, nutrients, TDS, or chlorides.

[52] EPA presents pollutant loadings and removals for metals, other than mercury, for immediate receiving waters designated as impaired for the general impairment category "metals (not mercury)" to protect confidential business information. See all results in Table 7-12.

Table 7-12. Pollutant Removals to Impaired Waters by Impairment Type

Impairment Type/Number of Receiving Waters [b]	Pollutant	Baseline Loadings (lbs/yr)	Pollutant Removals (lbs/yr) to Impaired Waters Under the Regulatory Options (Percent Reduction) [a]				
			Option A	Option B	Option C	Option D	Option E
Mercury-Impaired Receiving Waters							
30	Mercury	170	89.7 (53%)	90.2 (53%)	139 (81%)	168 (99%)	169 (99%)
Metals (Not Mercury)-Impaired Receiving Waters							
28	Arsenic	4,320	2,800 (65%)	2,800 (65%)	3,690 (85%)	4,110 (95%)	4,160 (96%)
	Boron	4,900,000	316,000 (6%)	316,000 (6%)	349,000 (7%)	361,000 (7%)	361,000 (7%)
	Cadmium	1,900	1,380 (73%)	1,380 (73%)	1,650 (87%)	1,770 (93%)	1,780 (94%)
	Chromium VI	27.2	23.4 (86%)	23.4 (86%)	26.9 (99%)	27.2 (>99%)	27.2 (>99%)
	Copper	4,420	2,490 (56%)	2,490 (56%)	3,790 (86%)	4,320 (98%)	4,320 (98%)
	Lead	2,700	1,360 (50%)	1,360 (50%)	2,240 (83%)	2,630 (97%)	2,630 (97%)
	Manganese	1,080,000	718,000 (66%)	718,000 (66%)	780,000 (72%)	810,000 (75%)	810,000 (75%)
	Nickel	15,600	9,270 (59%)	9,320 (60%)	13,300 (85%)	15,200 (97%)	15,300 (98%)
	Selenium	22,100	3,320 (15%)	20,900 (94%)	21,300 (96%)	21,500 (97%)	21,500 (97%)
	Thallium	7,330	1,260 (17%)	1,260 (17%)	5,220 (71%)	7,130 (97%)	7,130 (97%)
	Zinc	24,700	18,600 (75%)	18,600 (75%)	21,900 (89%)	23,500 (95%)	23,800 (96%)

Table 7-12. Pollutant Removals to Impaired Waters by Impairment Type

Impairment Type/Number of Receiving Waters [b]	Pollutant	Baseline Loadings (lbs/yr)	Pollutant Removals (lbs/yr) to Impaired Waters Under the Regulatory Options (Percent Reduction) [a]				
			Option A	Option B	Option C	Option D	Option E
Nutrient-Impaired Receiving Waters							
19	Total Nitrogen	492,000	7,250 (1%)	341,000 (69%)	395,000 (80%)	471,000 (96%)	471,000 (96%)
	Total Phosphorous	5,280	406 (8%)	406 (8%)	1,930 (37%)	4,090 (78%)	4,090 (78%)
TDS and Chlorides-Impaired Receiving Waters							
4	Chlorides	CBI	CBI	CBI	CBI	CBI	CBI
	TDS	CBI	CBI	CBI	CBI	CBI	CBI

Source: ERG, 2015c.

Acronyms: CBI (Confidential business information); lbs/yr (pounds per year).

Note: Loadings and pollutant reductions are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – For the impaired waters proximity analysis, EPA evaluated 222 immediate receiving waters that receive discharges of the evaluated wastestreams.

c – The EPA impaired water database listed 28 immediate receiving waters as impaired based on the “metal, other than mercury” impairment category. Of those 28 immediate receiving waters, 13 receiving waters are also listed as impaired for one or more specific metals (arsenic, cadmium, chromium, copper, lead, manganese, selenium, and zinc). One additional immediate receiving water is impaired for boron (but not included in the “metals, other than mercury” impairment category).

d – Total phosphorous and total nitrogen loadings are presented with this impairment category. Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

7.4.2 Threatened and Endangered Species

As discussed in Section 3.4.5, EPA identified 138 threatened and endangered species whose habitats overlap with, or are located within, surface waters that exceeded NRWQC for the protection of aquatic life under baseline conditions.[53] To assess the potential improvements to threatened and endangered species under the final rule, EPA initially selected only those species identified as highly vulnerable to changes in water quality (75 of the 138 species) for evaluation. EPA further excluded species from the analysis based on the following criteria: the species is already presumed extinct, species habitat is unlikely to be affected by discharges of the evaluated wastestreams (*e.g.*, isolated headwaters), species listing status is due to habitat destruction unrelated to steam electric power plant discharges (*e.g.*, damming, stream channelization), and other criteria. Based on the analysis, EPA identified 15 species out of the 75 that are highly vulnerable to changes in water quality and whose recovery may be enhanced by the final rule. Four of these 15 species inhabit waters that will no longer exceed NRWQC for the protection of aquatic life following implementation of the final rule. The species may therefore experience increases in population growth rates as a result of the final rule. See the Benefits and Cost Analysis for further details on the methodology and results of EPA's threatened and endangered species analysis.

7.4.3 Fish Advisory Waters

States, territories, and authorized tribes issue fish advisories to notify the public (including recreational and subsistence fishers) of waterbodies containing fish with elevated and potentially unhealthy contamination levels. Mercury is the most common pollutant found in steam electric power plant wastewater for which fish advisories are issued to the surface waters that receive the evaluated wastestreams (see Section 3.4.4). EPA determined that 88 of the 222 immediate receiving waters included in the EA are under a fish advisory for mercury. Under the final rule, the number of immediate receiving waters with fish that exceed EPA's mercury screening value for recreational fishers (based on steam electric power plant discharges only) will decrease by 63 percent, thereby reducing the potential threat to human health from consuming contaminated fish.

7.5 IMPROVEMENTS TO WATERSHEDS

As discussed in Section 3.4, both the Great Lakes and Chesapeake Bay watersheds have a history of receiving pollutant discharges that negatively affect water quality, wildlife, and human health. Both are well-studied, sensitive environments that are affected by pollutants commonly found in steam electric power plant wastewater. Mercury is one of the primary pollutants of concern in the Great Lakes,[54] and nutrients are the primary pollutants of focus in the Chesapeake Bay.

EPA identified 23 steam electric power plants that discharge into the Great Lakes watershed. Table 7-13 presents the pollutant reductions to the Great Lakes watershed under the

[53] The habitat locations evaluated for this analysis include waters downstream from steam electric power plant discharges and reflect changes in the industry as a result of the Clean Power Plan [Clean Air Act Section 111(d)].
[54] One of the main environmental pathways for mercury in the Great Lakes is from atmospheric deposition, which is not in the scope of the final rule.

regulatory options considered by EPA. Under the final rule, EPA estimates the following pollutant removals to the Great Lakes watershed:

- 2,070 pounds of arsenic annually (96 percent reduction).
- 612 pounds of cadmium annually (95 percent reduction).
- 1,880 pounds of lead annually (99 percent reduction).
- 80.6 pounds of mercury annually (97 percent reduction).
- 4,800 pounds of selenium annually (96 percent reduction).
- 9,510 pounds of thallium annually (99 percent reduction).
- 1.15 million pounds of total nitrogen annually (>99 percent reduction).
- 21,800 pounds of total phosphorus annually (94 percent reduction).

EPA identified nine steam electric power plants that discharge to the Chesapeake Bay watershed. Under the final rule, EPA estimates the following pollutant removals to the Chesapeake Bay watershed:

- 2,430 pounds of arsenic annually (97 percent reduction).
- 476 pounds of cadmium annually (93 percent reduction).
- 1,540 pounds of lead annually (99 percent reduction).
- 87.1 pounds of mercury annually (98 percent reduction).
- 6,380 pounds of selenium annually (97 percent reduction).
- 5,220 pounds of thallium annually (99 percent reduction).
- 990,000 pounds of total nitrogen annually (>99 percent reduction).
- 14,900 pounds of total phosphorus annually (89 percent reduction).

Table 7-13. Pollutant Removals to the Great Lakes Watershed Under the Regulatory Options

Pollutant	Baseline Loadings to the Great Lakes Watershed (lbs/yr)	Pollutant Removals (lbs/yr) to Great Lakes Watershed Under the Regulatory Options (Percent Reduction) [a]				
		Option A	Option B	Option C	Option D	Option E
Arsenic	2,170	47.5 (2%)	47.5 (2%)	513 (24%)	2,070 (96%)	2,130 (98%)
Boron	997,000	9,190 (1%)	9,190 (1%)	22,600 (2%)	66,800 (7%)	66,800 (7%)
Cadmium	648	53.6 (8%)	53.6 (8%)	183 (28%)	612 (95%)	623 (96%)
Chromium VI	0.548	0.471 (86%)	0.471 (86%)	0.548 (>99%)	0.548 (>99%)	0.548 (>99%)
Copper	2,550	34.5 (1%)	34.5 (1%)	608 (24%)	2,510 (99%)	2,520 (99%)
Lead	1,900	19.4 (1%)	19.4 (1%)	449 (24%)	1,880 (99%)	1,880 (99%)
Manganese	242,000	35,500 (15%)	35,500 (15%)	70,500 (29%)	188,000 (77%)	188,000 (77%)
Mercury	82.8	4.56 (6%)	4.91 (6%)	22.6 (27%)	80.6 (97%)	82.2 (99%)
Nickel	9,840	402 (4%)	413 (4%)	2,550 (26%)	9,720 (99%)	9,790 (99%)
Selenium	5,020	126 (3%)	3,780 (75%)	4,010 (80%)	4,800 (96%)	4,800 (96%)
Thallium	9,570	23.5 (<1%)	23.5 (<1%)	2,200 (23%)	9,510 (95%)	9,510 (99%)
Zinc	8,730	658 (8%)	658 (8%)	2,410 (28%)	8,270 (95%)	8,600 (99%)
Nitrogen, total [b]	1,150,000	2,420 (<1%)	380,000 (33%)	556,000 (48%)	1,150,000 (>99%)	1,150,000 (>99%)
Phosphorus, total	23,100	135 (1%)	135 (1%)	5,110 (22%)	21,800 (94%)	21,800 (94%)
Chlorides	31,900,000	11,400 (<1%)	11,400 (<1%)	698,000 (2%)	3,000,000 (9%)	3,000,000 (9%)
TDS	186,000,000	3,890,000 (2%)	3,890,000 (2%)	22,300,000 (12%)	83,900,000 (45%)	83,900,000 (45%)

Source: ERG, 2015a; ERG, 2015c.

Acronyms: lbs/yr (pounds per year).

Note: Loadings and pollutant removals are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

7.6 ENVIRONMENTAL AND HUMAN HEALTH IMPROVEMENTS IN DOWNSTREAM SURFACE WATER

EPA estimates that the environmental and human health improvements in the immediate receiving waters expected from the final rule will translate into considerable improvements in water quality further downstream from steam electric power plant discharges. EPA calculated downstream receiving water pollutant concentrations using EPA's Risk-Screening Environmental Indicators (RSEI) model[55] and compared these concentrations to the same NRWQC and MCL water quality benchmarks used in the IRW model national-scale analysis. EPA also evaluated the wildlife (mink and eagle NEHC benchmarks) and human health (cancer and non-cancer) improvements in downstream surface waters using a simplified version of the IRW model national-scale analysis. This approach involved calculating the water pollutant concentrations that would result in exceedances if used as inputs to the wildlife and human health modules in the IRW model; EPA then compared the downstream receiving water pollutant concentrations in RSEI to these "threshold" concentrations to identify the downstream reaches that would have at least one exceedance of a particular wildlife or human health benchmark.[56] EPA used this approach to estimate the extent (in river miles) of environmental and human health impacts in downstream surface waters under baseline conditions and the improvements under the modeled regulatory options (Options A, B, C, D, and E). Table 7-14 presents the results of this downstream analysis.

Based on the results of the downstream modeling, thousands of downstream river miles are impacted by steam electric power plant discharges. Pollutant concentrations exceed NRWQC for human health (water and organism) in 4,400 river miles downstream from immediate receiving waters. However, under the final rule, this drops by 2,390 river miles (54 percent). The final rule reduces the number of downstream exceedances for each of the NRWQCs and MCLs evaluated. This reduction improves the water quality and aquatic habitats available to wildlife and human populations located outside of the immediate vicinity of steam electric power plants. In addition, pollutant removals under the final rule also reduce impacts to wildlife that rely on downstream aquatic habitats as a food source. Up to 1,040 miles of surface waters downstream from steam electric power plant discharges will no longer contain fish populations that exceed an NEHC benchmark for minks or eagles. The final rule also decreases potential exposure of humans to pollutants that can cause non-cancer health effects from consumption of contaminated fish in up to 5,470 river miles. These results demonstrate that steam electric power plant discharges are impacting surface waters beyond the immediate receiving waters. Pollutant removals associated with the final rule will substantially improve the environmental and human health for communities beyond the area immediately surrounding steam electric power plants.

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[55] EPA used pollutant loadings discharged to each receiving reach by steam electric power plants to estimate concentrations in downstream reaches. The RSEI model uses a simple dilution and first-order decay equation to calculate receiving water concentrations (metals are treated as conservative substances). The RSEI model assumes that the plant's annual discharge is released at a constant rate throughout the year. In addition, EPA included pollutant loadings from EPA's Toxics Release Inventory (TRI) database for other industries to represent background pollutant concentrations in the downstream receiving waters. For further details on the RSEI model methodology and assumptions, see the Benefits and Cost Analysis.

[56] See the ERG memorandum "Downstream EA Modeling Methodology and Supporting Documentation" (DCN SE04455) regarding the calculation of these water pollutant concentration thresholds.

Table 7-14. Key Environmental Improvements for Downstream Waters Under the Regulatory Options

Evaluation Criteria	Number of River-Miles Exceeding Criteria Under Baseline Conditions	Number of River-Miles Exceeding Criteria (Percent Reduction from Baseline Conditions) Under the Regulatory Options [a]				
		Option A	Option B	Option C	Option D	Option E
Water Quality Results						
Freshwater Acute NRWQC	417	396 (5%)	396 (5%)	394 (5%)	390 (7%)	390 (7%)
Freshwater Chronic NRWQC	628	612 (3%)	569 (9%)	547 (13%)	518 (18%)	518 (18%)
Human Health Water and Organism NRWQC	4,400	3,670 (17%)	3,670 (17%)	2,620 (40%)	2,010 (54%)	1,760 (60%)
Human Health Organism-only NRWQC	1,560	1,300 (16%)	1,300 (16%)	1,070 (31%)	782 (50%)	713 (54%)
Drinking Water MCL	759	731 (4%)	726 (4%)	630 (17%)	487 (36%)	487 (36%)
Wildlife Results						
Fish Ingestion NEHC for Minks	1,180	917 (23%)	892 (25%)	723 (39%)	527 (56%)	504 (57%)
Fish Ingestion NEHC for Eagles	2,000	1,730 (13%)	1,720 (14%)	1,390 (30%)	959 (52%)	901 (55%)
Human Health Results—Non-Cancer						
Non-cancer reference dose for child (recreational)	6,350	4,900 (23%)	4,890 (23%)	3,130 (51%)	2,310 (64%)	2,150 (66%)
Non-cancer reference dose for adult (recreational)	3,760	2,960 (21%)	2,950 (21%)	2,050 (46%)	1,470 (61%)	1,380 (63%)
Non-cancer reference dose for child (subsistence)	10,100	8,380 (17%)	8,350 (17%)	6,150 (39%)	4,630 (54%)	4,240 (58%)
Non-cancer reference dose for adult (subsistence)	7,110	5,580 (22%)	5,570 (22%)	3,720 (48%)	2,770 (61%)	2,540 (64%)

Table 7-14. Key Environmental Improvements for Downstream Waters Under the Regulatory Options

Evaluation Criteria	Number of River-Miles Exceeding Criteria Under Baseline Conditions	Number of River-Miles Exceeding Criteria (Percent Reduction from Baseline Conditions) Under the Regulatory Options [a]				
		Option A	Option B	Option C	Option D	Option E
Human Health Results—Cancer						
Cancer risk for child (recreational)	231	216 (7%)	216 (7%)	211 (9%)	210 (9%)	207 (10%)
Cancer risk for adult (recreational)	286	263 (8%)	263 (8%)	251 (12%)	246 (14%)	245 (14%)
Cancer risk for child (subsistence)	262	241 (8%)	241 (8%)	239 (9%)	235 (10%)	231 (12%)
Cancer risk for adult (subsistence)	446	383 (14%)	383 (14%)	358 (20%)	328 (27%)	304 (32%)

Source: ERG, 2015i; ERG, 2015l.

Note: River miles are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – EPA evaluated a total of 73,000 river-miles in the downstream receiving water analysis for toxic, bioaccumulative pollutants. Downstream receiving water concentrations are calculated until one of three conditions occurs: 1) the discharge travels 300 kilometers (km) downstream; 2) the discharge travels downstream for a week; or 3) the concentration reaches 1 x 10^{-9} milligrams per liter (mg/L).

7.7 ATTRACTIVE NUISANCES

EPA projects that the final rule will also decrease the environmental impact to wildlife exposed to pollutants through direct contact with surface impoundments and constructed wetlands at steam electric power plants. Multiple studies show that wildlife living near steam electric surface impoundments exhibit elevated levels of arsenic, cadmium, chromium, lead, mercury, selenium, strontium, and vanadium [Burger *et al*., 2002; Bryan *et al*., 2003; Hopkins *et al*., 1997, 1998, 2000, 2002, 2006; Nagle *et al*., 2001; Rattner *et al*., 2006]. Multiple studies have linked attractive nuisance areas at steam electric power plants to diminished reproduction [Hopkins *et al*., 2002, 2006; Nagle *et al*., 2001]. While the final rule does not control pollutants within surface impoundments or constructed wetlands prior to their discharge to surface waters, EPA estimates that the final rule will decrease pollutant loadings to these waterbodies (*e.g.*, through plants converting to dry handling their fly ash). These pollutant removals will decrease the exposure of wildlife populations to toxic pollutants and decrease the threat that combustion residual surface impoundments pose to surrounding wildlife.

7.8 OTHER SECONDARY IMPROVEMENTS

In addition to the improvements discussed above, other secondary, or ancillary, other resources will see improvements that are associated directly or indirectly with the final rule. Pollutant removals not only improve water quality in surface waters but enhances their aesthetic (*e.g.*, by improving clarity and decreasing odor and discoloration). Cleaner surface water improves the source of drinking water for both surface water treatment plants and wells that are influenced by surface water; water used for irrigation; and water used for industrial uses (less contaminants). Recreational benefits from water quality improvements include more enjoyment from swimming, fishing, and boating and potentially increased revenue from more people partaking of recreational activities. The final rule may also reduce economic impacts such as clean-up and treatment costs for contamination or impoundment failures, reduced injury associated with surface impoundment failures, reduced water usage, reduced potential for algal blooms, and decreased air emissions.

The Benefits and Cost Analysis monetizes benefits of implementing the final rule (increased aesthetics, recreational improvements, increased availability of ground water resources, reduced risk of surface impoundment failures, and air quality improvements). In addition, the document also qualitatively discusses improvements to the quality of source water for drinking, irrigation, and industrial use; quantity and quality of recreational opportunities; improved commercial fisheries yields; increased property values; and reduced sediment contamination within receiving waters.

While the final rule does not control pollutants leaching to ground water from surface impoundments and landfills containing combustion residuals, EPA estimates that the final rule will decrease pollutant loadings to surface impoundments (*e.g.*, through plants converting to dry handling their fly ash). These pollutant removals will decrease pollutants leaching from combustion residual surface impoundments to ground water and decrease the potential human health impacts associated with exposure to contaminated drinking water wells (see Section 3.3.4). EPA, however, did not quantify or monetize the benefits associated with this improvement to ground water quality.

7.9 UNRESOLVED DRINKING WATER IMPACTS DUE TO BROMIDE DISCHARGES

As discussed in Section 3.1.3, bromide in water can form brominated disinfection by-products (DBPs), some potentially carcinogenic, when drinking water plants use certain processes including chlorination and ozonation to disinfect the incoming source water. The national effluent limitations guidelines and standards under the final rule (regulatory Option D) do not directly control TDS levels (including bromides) in FGD wastewater discharges from all steam electric power plants.[57] Coal-fired steam electric power plants can discharge bromide due to its natural presence in coal (which is released when burned and/or captured in particulates by baghouses and FGD controls) or through bromide addition to flue gas control processes to reduce mercury emissions. Steam electric power plant discharges occur close to more than 100 public drinking water intakes on rivers and other waterbodies and there is evidence that bromide discharges are already having adverse effects on the quality of drinking water sources.

While bromide itself is not thought to be toxic at levels present in the environment, its reaction with other constituents in water may be of concern now and into the future. Drinking water utilities should be concerned about bromides affecting drinking water sources, as bromide loadings into surface waters could potentially increase in the future as more coal-fired steam electric power plant operators add bromide to help control mercury emissions. Although EPA decided not to finalize BAT requirements based on evaporation for treating FGD wastewater at all steam electric power plants in the final rule, evaporation technology is potentially available and may be appropriate for achieving water quality-based effluent limitations, depending on site-specific conditions, where drinking water supplies need to be protected.

[57] They do, however, directly control TDS in cases where steam electric power plants opt into the voluntary incentives program, in which they would be subject to effluent limitations based on evaporation technology.

SECTION 8
CASE STUDY MODELING

EPA developed dynamic water quality models of selected case study locations to supplement the water quality component of the national-scale immediate receiving water (IRW) model. EPA performed the case study modeling to provide additional resolution regarding the baseline impacts and the expected environmental and human health improvements under the final rule, while encompassing a broader temporal and spatial scope than what is included in the IRW model. The case study models also validate and provide additional perspective on the results of the IRW model for those waterbodies included in both models. The case study modeling improves upon the IRW model in the following ways:

- Accounts for long-term pollutant loadings from steam electric power plants (under both baseline conditions and the final rule) and estimates the resultant accumulation of pollutants within the water column and sediments of the receiving water. These models can more accurately assess baseline pollutant concentrations and the time frame and magnitude of environmental improvements associated with the final rule.
- Accounts for fluctuations in receiving water flow rates by using daily stream flow monitoring data instead of one annual average flow rate for the receiving water. This approach better reflects the varying influence of dilution (or lack thereof) within the receiving water during high-flow and low-flow conditions.
- Accounts for pollutant transport and accumulation within receiving water reaches that are downstream from the discharge location. This approach can more accurately estimate the river distance showing environmental impacts under baseline conditions and improvements under the final rule.[58]
- Accounts for pollutant contributions from other point, nonpoint, and background sources, to the extent practical, using available data sources. Incorporating non-steam-electric pollutant sources and available water quality data provides a more complete illustration of the compounding impacts of background pollutant concentrations, steam electric power plant pollutant loadings, and other point source dischargers.

This section describes EPA's methodology for developing and running the case study models (Section 8.1); presents the results of the case study models for the selected case study locations (Section 8.2); and compares the case study and IRW model results (Section 8.3).

[58] The case study downstream modeling described in this section is separate from the downstream modeling EPA performed using the Risk-Screening Environmental Indicators (RSEI) model and the SPARROW (SPAtially Referenced Regressions On Watershed attributes) model. EPA used the national-scale RSEI and SPARROW models to quantify changes in water quality in support of the benefits analysis for the final rule. See the *Benefits and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category* (EPA-821-R-15-005).

8.1 CASE STUDY MODELING METHODOLOGY

The case studies use EPA's Water Quality Analysis Simulation Program (WASP), a dynamic compartment-modeling program for aquatic systems that simulates pollutant fate and transport within both the water column and the benthic sediment. The WASP model helps users interpret and predict water quality responses to natural phenomena and man-made pollution for various pollutant management decisions. EPA's approach also relies on U.S. Geological Survey (USGS) daily stream flow data downloaded through EPA's Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) interface to provide input time series flow data for use in the WASP model.

This section is organized as follows:

- Section 8.1.1 discusses EPA's approach for selecting case study locations (*i.e.*, steam electric power plants and receiving waters) for case study modeling, including the differences in selection criteria for lotic, lentic, and estuarine water systems.
- Section 8.1.2 summarizes the scope and general technical approach for the case study modeling, including the selection of pollutants and wastestreams for modeling; the data sources evaluated for non-steam-electric pollutant contributions; and approaches for modeling pollutant levels before and after the assumed final rule compliance date.
- Section 8.1.3 explains the development and execution of the case study models using WASP. Appendix G provides additional information regarding the specific input parameters (*e.g.*, background pollutant concentrations, USGS time series flow data) and model settings (*e.g.*, solids transport parameters) for each of the WASP models. For additional documentation regarding the selection and calculation of the input parameters and settings, refer to the ERG memorandum, "Technical Approach for Case Study Water Quality Modeling of Aquatic Systems in Support of the Final Steam Electric Power Generating Industry Environmental Assessment" (DCN SE05570) (*Case Study Water Quality Modeling Memorandum*).
- Section 8.1.4 describes the use of the case study model outputs to determine impacts to aquatic life based on changes in water quality; impacts to aquatic life based on changes in sediment quality; impacts to wildlife from consuming contaminated aquatic organisms; and impacts to human health from consuming contaminated fish.
- Section 8.1.5 lists some of the limitations and assumptions involved with EPA's case study modeling.

8.1.1 <u>Selection of Case Study Locations for Modeling</u>

To select locations for detailed case study modeling, EPA developed site-selection criteria to identify a collection of steam electric power plants and receiving waters that, when evaluated as a group:

- Represent a reasonable cross-section of the range of receiving waters evaluated in the environmental assessment (EA).
- Illustrate pollutant removals across the regulatory options evaluated by EPA.

- Encompass discharges of all four wastestreams evaluated in the EA.
- Demonstrate pollutant loadings that are representative of those discharged by steam electric power plants evaluated in the EA (*i.e.*, discharges are typical of steam electric power plants and not outlier values).

EPA evaluated 195 steam electric power plants that discharge directly to aquatic systems with lotic characteristics (rivers and streams), lentic characteristics (lakes, ponds, and reservoirs), or that are estuarine systems. Through the site-selection process described below, EPA identified six representative case study locations (five lotic sites and one lentic site) that capture improvements across multiple regulatory options, represent all four evaluated wastestreams (flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, and combustion residual leachate), and represent both lentic and lotic aquatic environments. Figure 8-1 and Table 8-1 present the six receiving waters that EPA selected for case study modeling.

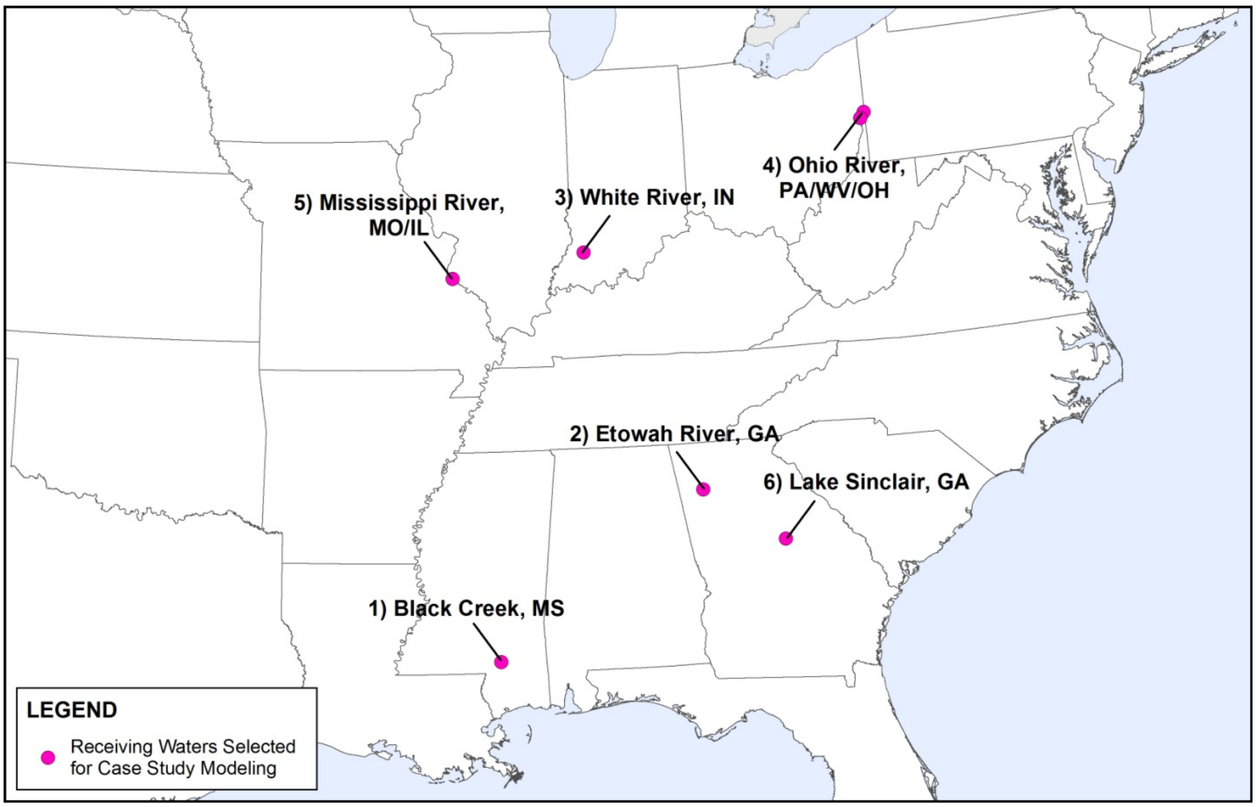


Figure 8-1. Overview of Case Study Modeling Locations

Table 8-1. Locations Selected for Case Study Modeling

Case Study Location	Water-body Type	Steam Electric Power Plant(s) Modeled	Evaluated Wastestreams Discharged				Regulatory Options Demonstrating Removals				Model Length (river-miles)	Modeling Period [a]
			FGD	Fly Ash	Bottom Ash	Leachate	A	B	C	D		
Black Creek, MS	Lotic	R.D. Morrow Sr. Generating Site	✓		✓	✓	✓	✓		✓	97	1982-2036 (55 years)
Etowah River, GA	Lotic	Plant Bowen	✓		✓		✓	✓	✓		35	1982-2032 (51 years)
Lick Creek & White River, IN	Lotic	Petersburg Generating Station	✓		✓			✓	✓	✓	53	1986-2034 (49 years)
Ohio River, PA/WV/OH	Lotic	Bruce Mansfield Plant & W.H. Sammis Plant	✓		✓	✓	✓	✓	✓	✓	44	1982-2036 (55 years)
Mississippi River, MO/IL	Lotic	Rush Island [b]		✓	✓		✓		✓		65	1982-2036 (55 years)
Lake Sinclair, GA	Lentic	Plant Harllee Branch [c]	✓	✓	✓		✓	✓	✓	✓	N/A	2012-2025 (14 years)

Acronym: FGD (flue gas desulfurization); N/A (Not applicable).

a – The modeling periods start at 1982 (the year of the last revision to the steam electric effluent limitations guidelines and standards (ELGs) or the date of installation of the most recent generating unit impacted by the final rule (if after 1982). The duration of the modeling period is influenced by the available time periods covered by USGS time series flow data and by the assumed date upon which the steam electric power plant would achieve the limitations under the final rule, as determined based on the plant's National Pollutant Discharge Elimination System (NPDES) permitting cycle.

b – EPA identified another steam electric power plant, Meramec, that discharges upstream of the Rush Island plant. EPA incorporated the pollutant loadings of the Meramec plant to account for the upstream pollutant contributions. EPA did not evaluate the water quality, wildlife, or human health impacts associated with discharges from the Meramec plant because this plant was not selected using the case study selection methodology described in this section.

c – This steam electric power plant has decertified and retired all of its steam electric generating units. EPA selected this plant to represent the potential impacts of discharges of the evaluated wastestreams to lentic waterbodies because it meets all of the case study selection criteria.

Selection of Lotic Case Study Locations

To select lotic receiving waters to model using WASP, EPA reviewed all combinations of steam electric power plants and their receiving waters evaluated in the EA for factors that would negatively influence the ability to use WASP for case study water quality modeling or the ability to discuss the case study modeling results in a public document. EPA completed an assessment using industry responses to the 2010 *Questionnaire for the Steam Electric Power Generating Effluent Guidelines* (the Steam Electric Survey), EPA's BASINS tool, National Hydrography Dataset Plus (NHDPlus Version 1) hydrography layers, and USGS National Water Information System (NWIS) data sources to identify and eliminate the lotic receiving waters that met one or more of the following criteria from consideration for case study modeling:

- Confidential Business Information (CBI). EPA identified and eliminated steam electric power plants with CBI claims on discharge flow rate data for any of the four evaluated wastestreams. EPA eliminated these plants as potential case study locations because CBI data, including modeled water concentrations based on CBI data, cannot be discussed in a public document such as this EA report.
- Stream gage flow data. EPA identified and eliminated receiving waters that lack sufficient stream gage flow data. Availability of a long-term, continuous stream flow record for both the receiving water being modeled and any significant downstream tributaries was a major factor in selecting case study locations because these data are needed to construct the hydrodynamics in WASP. The primary considerations when reviewing the sufficiency of stream gage flow data for use in WASP were the following:
  - Location of USGS stream gage stations (the ideal location is within the vicinity of the immediate receiving water being evaluated, plus additional locations within the model area).
  - A continuous stream flow record covering a time period that matches or exceeds the length of the desired modeling period.
  - Age of the stream gage flow data (data sets without data from within the previous 30 years were considered potentially unrepresentative of current flow conditions).
- Downstream waterbody characteristics. WASP's ability to accurately model water quality using USGS stream gage flow data can be affected by flow control structures such as dams that affect the linear flow and circulation of water, and thus influence the transport of pollutants. EPA identified and eliminated receiving waters whose downstream waterbodies exhibit these characteristics, unless the areas of concern were sufficiently downstream to allow for modeling of a reasonable distance (*i.e.*, at least 25 miles) before encountering the area of concern.
- Influence by other point source dischargers that could not be modeled. EPA identified receiving waters that could be significantly influenced by discharges from other point sources (including other steam electric power plants) and evaluated whether those point sources would meet the criteria listed above for case study modeling. If EPA determined that a receiving water would be significantly influenced by other point source discharges that could not be modeled (*e.g.*, an upstream steam electric power

plant exercising CBI claims) or represented in the model by STORET monitoring data (see Section 8.1.3), EPA eliminated the receiving water from consideration. If EPA deemed the pollutant loadings from the other point source discharges to be insignificant compared to the steam electric power plant pollutant loadings being evaluated, EPA included the receiving water in the analysis.[59]

Next, EPA assessed the representativeness of the steam electric power plants and receiving waters that were not eliminated based on the criteria above. EPA selected the receiving water flow rate, magnitude of pollutant loadings from the evaluated wastestreams, and water column concentrations output calculated based on these values as the primary factors in determining whether it considered a particular receiving water representative. EPA reviewed the average annual flow rates (as defined in NHDPlus Version 1), baseline loadings of the modeled pollutants, and water column concentrations output from the IRW model of each of the steam electric power plants and receiving waters that were not eliminated after application of the acceptance criteria. EPA assessed how each plant and receiving water compared to the general population in the EA and eliminated plant and receiving water combinations that did not reasonably represent typical conditions. From the population of lotic receiving waters that EPA determined would be suitable for WASP modeling and representative of typical pollutant loadings from discharges of the evaluated wastestreams, the Agency selected a collection that, when evaluated as a group, demonstrated pollutant removals across all modeled regulatory options and all four evaluated wastestreams. As a result, EPA identified five case study locations as the best candidates for modeling as part of a representative set of steam electric power plants that discharge to lotic systems. The selected case study locations are further described in Section 8.2.[60] Additional information about EPA's methodology for selecting plants and receiving waters that are representative and suitable for WASP modeling is further described in the *Case Study Water Quality Modeling Memorandum* (DCN SE05570).

Selection of Lentic and Estuarine Case Study Locations

Water quality modeling of lentic systems (lakes, ponds, and reservoirs) or estuarine systems involves more complex hydrodynamics that would not be adequately represented by stream gage flow data. Modeling steam electric power plants that discharge to lentic or estuarine systems requires using existing EPA-developed WASP models (or more specifically, the underlying hydrodynamic data) for the specific waterbodies of interest. Accordingly, EPA considered the availability of existing models a primary factor in selecting lentic and estuarine systems for case study water quality modeling.

[59] EPA considered receiving water flow rate, distance between outfalls, and relative magnitude of pollutant loadings when assessing whether the discharges from upstream or downstream plants or point sources could significantly affect the water quality modeling results for the selected case study location. EPA applied best professional judgment using these criteria, but did not apply numeric thresholds.

[60] Because of the level of effort required to design, execute, and evaluate the outputs for case study modeling, EPA did not complete case study modeling for all candidates that met all acceptance criteria and were determined to be representative. EPA used best professional judgment in determination of which five case study locations were the best candidates for modeling and represent a reasonable cross-section of the range of receiving waters evaluated in the EA.

EPA identified one preexisting WASP model for a lake (Lake Sinclair, GA) that receives steam electric power plant discharges from Georgia Power Company's Plant Harllee Branch. As of April 16, 2015, this plant has decertified and retired all four of its coal-fired generating units. Based on a review of the water concentration outputs generated by the IRW model in support of the proposed ELGs (which were developed prior to the announcement of plans to retire Plant Harllee Branch), EPA determined that Lake Sinclair remains a representative illustration of lentic waterbodies that receive discharges of the evaluated wastestreams. As discussed in Section 3, pollutant loadings to lentic systems often more strongly affect water quality and ecosystem health (compared to lotic systems) due to the longer residence times and associated long-term accumulation of pollutants in these systems. Accordingly, and despite the retirement of Plant Harllee Branch, EPA proceeded with case study modeling of Lake Sinclair to represent the potential impacts of steam electric power plant discharges on lentic waterbodies (including the 26 lake, pond, and reservoir receiving waters evaluated in this EA) and the potential environmental improvements under the final rule in other lentic waterbodies that receive discharges of the evaluated wastestreams.

EPA also identified one preexisting water WASP model for an estuary (Hillsborough Bay, FL) that receives steam electric power plant discharges. However, due to the hydrologic complexity of the model, and because estuarine systems represent less than 2 percent of the receiving waters evaluated in the EA, EPA elected to develop only freshwater river and lake WASP models for this case study analysis. Additionally, the ecological risk modeling approach described in Section 5.2 is based on selenium bioaccumulation within freshwater environments and would not be appropriate to apply to estuarine or marine aquatic systems, which would limit EPA's ability to analyze the ecological effects for the estuarine case study.

8.1.2 <u>Scope and Technical Approach for Case Study Modeling</u>

This section describes the scope and technical approach used for EPA's detailed case study modeling, including the selection of pollutants and wastestreams evaluated, the inclusion of other point and nonpoint sources, the development of a historical baseline for the case study location, and the prediction of decreased water and sediment pollutant concentrations under the regulatory options evaluated for the final rule.

<u>Selection of Pollutants for Modeling</u>

EPA approached the case study modeling with the goal of modeling the same 10 pollutants included in the IRW model, which are listed in Section 5.1. As described later in this section, however, EPA was unable to perform case study modeling for chromium VI and mercury. EPA performed case study water quality modeling for the following eight pollutants (or "toxicants" as defined in the WASP model), which were also included in the IRW model:

- Arsenic (As).
- Cadmium (Cd).
- Copper (Cu).
- Lead (Pb).
- Nickel (Ni).
- Selenium (Se).

- Thallium (Tl).
- Zinc (Zn).

These pollutants can be modeled using the Simple Toxicant module within WASP. Similar to the water quality module of the IRW model, the Simple Toxicant module applies pollutant-specific partition coefficients to estimate the degree to which pollutants in the water column will adsorb to benthic sediments and suspended solids. Unlike the IRW model, the Simple Toxicant module does not incorporate separate partition coefficients to define the benthic sediment/pore water equilibrium and the suspended sediment/water column equilibrium. Therefore, EPA selected only the suspended sediment-water (Kd_{sw}) partition coefficient for each pollutant (see Table C-4 in Appendix C).

EPA also considered using WASP to perform water quality modeling for chromium VI and mercury. These pollutants, however, require using more data-intensive modules within WASP. Accurately modeling chromium VI requires using the META4 module within WASP to accurately predict pollutant speciation and depends on the availability of extensive site-specific monitoring data. Modeling mercury (and methylmercury, a bioaccumulative organic form of mercury) requires using the MERC7 module within WASP to account for transformation processes such as methylation. Using the more data-intensive modules requires site-specific data that were not available for all locations.

Evaluated Wastestreams

The case study models quantified the water quality impacts resulting from discharges of the same four evaluated wastestreams included in the IRW model:

- Fly ash transport water.
- Bottom ash transport water.
- FGD wastewater.
- Combustion residual leachate.

As with the IRW model, EPA performed the WASP water quality modeling using average daily pollutant loadings derived from average annual pollutant loadings and normalized effluent flow rates. This assumption of a static loadings rate does not account for temporal variability in the loadings to receiving waters due to factors such as variable plant operating schedules, storm flows, low-flow events, and catastrophic events.

Inclusion of Other Point and Nonpoint Sources

Accounting for pollutant contributions from non-steam-electric point sources and nonpoint sources, to the extent practical using available data, can improve the accuracy of the case study water quality models. EPA identified the following data sources that provide pollutant loadings and/or concentration data for these other sources potentially affecting water quality in the case study location:

- Discharge Monitoring Reports (DMR). Point source dischargers are required to report certain wastewater monitoring data through the submittal of DMRs. However, they are required to report only for the pollutants that are listed in the facility's National

Pollutant Discharge Elimination System (NPDES) permit.[61] EPA evaluated 2011 pollutant loadings data for direct dischargers including publicly owned treatment works (POTWs) and industrial facilities.

- Toxics Release Inventory (TRI). TRI collects facility-reported estimates of wastewater loadings data for both direct and indirect dischargers. The TRI database does not include loadings from facilities with total annual chemical releases of less than 500 pounds and incorporates assumptions regarding plants with annual releases of less than 1,000 pounds. The point source loadings from smaller facilities, therefore, may not be well represented in the TRI database.[62] EPA evaluated 2011 pollutant loadings data for industrial facilities with indirect discharges of a modeled pollutant. EPA also evaluated TRI direct pollutant loadings data for these facilities and pollutants if the facilities are not also required to report this pollutant in their DMRs (to avoid double-counting direct discharges).
- STORET Monitoring Data. EPA's STORET database is a repository for water quality, biological, and physical data compiled from many data sources and locations throughout the country. The STORET database contains water quality and sediment quality monitoring data for all eight modeled pollutants and other input parameters for WASP including total organic carbon (TOC) and total suspended solids (TSS).

EPA reviewed these publicly available data sources to identify pollutant contributions from non-steam-electric point sources and nonpoint sources that may impact the case study water quality model. EPA also used available STORET monitoring data to help calibrate the modeled outputs. For additional documentation regarding EPA's collection and use of these data, refer to the *Case Study Water Quality Modeling Memorandum* (DCN SE05570).

Modeling of Pollutant Loadings Prior to the Final Rule

EPA developed and executed WASP models (as described in Section 8.1.3) for the selected case study locations to predict the baseline accumulation of pollutants in the receiving water and sediment leading up to implementation of the final rule.

The modeling periods start at 1982 (the year of the last revision to the steam electric ELGs) or the date of installation of the most recent generating unit impacted by this rulemaking (if after 1982), and extend to the assumed compliance date.[63] If the available stream gage flow

[61] In addition, states (or other permitting authorities) have some discretion as to which data they make available (or enter) to the national database (*i.e.*, Permit Compliance System (PCS) and Integrated Compliance Information System for the National Pollutant Discharge Elimination System (ICIS-NPDES)). For example, permitting authorities enter DMR and permit information for facilities that are considered major dischargers. However, they do not necessarily enter DMR or permit information into PCS for minor dischargers or facilities covered by a general permit.

[62] Other limitations of the data collected in TRI include the following: small establishments are not required to report, nor are facilities that do not meet reporting thresholds; releases reported are based on estimates, not measurements; certain chemicals are reported as a class, not as individual compounds; facilities are identified by North American Industrial Classification System (NAICS) code, not point source category; and TRI requires facilities to only report certain chemicals and therefore all pollutants discharged from a facility may not be captured.

[63] For each steam electric power plant in the case study modeling, EPA assumed a plant-specific date, derived from the plant's permitting cycle, that the plant would achieve the limitation under the final rule.

data did not cover the desired modeling period, EPA extrapolated the available data, incorporating another partial cycle of the flow data to reach the total desired modeling period.

Historical pollutant loadings data for the evaluated wastestreams and non-steam-electric point sources are very limited and difficult to obtain, so EPA used Steam Electric Survey data (representing plant operations in 2009), STORET monitoring data, and 2011 TRI and DMR loadings data as a representative set of discharge conditions. EPA acknowledges that these data may not reflect the actual pollutant loadings over the entire modeling period; however, they represent an appropriate estimation of annual pollutant loadings and how discharges may affect individual aquatic systems over time.

For each case study location, EPA assumed that the annual, historical pollutant loadings associated with fly ash transport water, bottom ash transport water, and combustion residual leachate discharges were equal to the baseline pollutant loadings calculated for these wastestreams (*i.e.*, the same annual pollutant loadings used to represent baseline conditions in the national-scale IRW model). The impoundment and discharge of these wastestreams has been a standard technique practiced since before 1982. EPA did not attempt to determine whether a modeled plant had historical discharges of an evaluated wastestream that are not represented in the baseline pollutant loadings. For example, for a plant that does not have fly ash transport water pollutant loadings under baseline conditions, EPA did not attempt to determine whether the plant had historical discharges of fly ash transport water.

In estimating the annual, historical pollutant loadings associated with FGD wastewater, EPA accounted for the fact that steam electric power plants may have installed FGD systems after the start of the modeling period. EPA used the FGD system installation dates, based on industry responses to the Steam Electric Survey, to determine how to incorporate FGD wastewater pollutant loadings into the case study model. If a plant installed multiple FGD systems during the modeling period, EPA assumed that the annual, historical FGD wastewater pollutant loadings associated with each individual system were proportional to that system's flow rate contribution compared to the total FGD wastewater flow rate under baseline conditions. The procedure for calculating and incorporating the proportional loadings for each FGD system is further described in the *Case Study Water Quality Modeling Memorandum* (DCN SE05570).

EPA accounted for pollutant loadings from non-steam-electric point sources within the modeling boundary by using 2011 TRI and DMR data. EPA assumed that the annual, historical pollutant loadings for these point sources throughout the modeling period were equal to the pollutant loadings reported in the 2011 TRI and DMR data sets. To account for contributions from nonpoint sources, EPA evaluated STORET water quality monitoring data collected upstream of the modeling boundary. The Agency used these monitoring data to represent the pollutant contributions from all point, nonpoint, and background sources upstream of the monitoring location, potentially avoiding the need to collect TRI and DMR pollutant loadings data and perform WASP modeling of those upstream or tributary reaches. The *Case Study Water Quality Modeling Memorandum* (DCN SE05570) further discusses how EPA incorporated DMR pollutant loadings data, TRI pollutant loadings data, and STORET monitoring data into the WASP water quality models.

The results of this baseline modeling provided initial receiving water and sediment concentrations for modeling discharges after the assumed compliance date, discussed in the following section.

Modeling of Pollutant Loadings Under the Final Rule

EPA developed and executed WASP water quality models (as described in Section 8.1.3) for the selected case study locations to predict the decreases of receiving water and sediment pollutant concentrations (relative to baseline conditions) following implementation of the final rule.

EPA executed separate models for continued baseline pollutant loadings and regulatory option pollutant loadings (Options A through D)[64]. These modeling periods started at the assumed compliance date, as determined by each steam electric power plant's permitting cycle, and continued for at least 10 years after the assumed compliance date. EPA used the pollutant loadings calculated under the regulatory options to represent the annual steam electric pollutant loadings for each year of the period following implementation of the final rule. EPA assumed that the pollutant contributions from non-steam-electric point sources (based on TRI and DMR data) and from nonpoint sources (based on STORET monitoring data) would remain constant and would be equal to those used to model the period leading up to implementation of the final rule.

8.1.3 Development and Execution of WASP Models

EPA built each case study model using the BASINS setup tool for WASP, known as the WASP Model Builder, which allows the user to open WASP directly from the BASINS interface. As described in Section 8.1.2, EPA's approach used the Simple Toxicant module within WASP for the eight modeled pollutants. The Simple Toxicant module puts stretches of the modeled receiving water into segments based on the hydrologic characteristics. The WASP model calculates the water column and benthic pollutant concentrations using user-defined parameters and default assumption values. The process described in this section is based on using WASP Version 7.52 and BASINS Version 4.1. Both represent the most current versions available for EPA's analysis.

EPA followed the general approach described below in developing the WASP models for each of the lotic case study locations:

- WASP calculates receiving water and sediment concentrations by dividing the waterbody into segments and performing calculations for each segment. EPA used NHDPlus Flowlines as the basis for defining waterbody segments. To maintain reasonable model runtimes and reduce system instability, EPA further refined these segments by combining short segments such that the flow time through each segment is at least a tenth of a day. In some cases, segment travel times were shorter than the

[64] Case study modeling omitted Option E because EPA determined that the additional pollutant removals for Option E are only marginally better than Option D. Under Option E, only R.D. Morrow Generating Station and W.H. Sammis plant would have additional removals.

desired minimum because the segment was located between an upstream and downstream tributary of some significance.

- EPA used USGS stream gage flow data to represent inflows at the upstream end of the case study location, as well as any significant tributary with a USGS stream gage station. In all cases, EPA scaled the stream gage flow data to account for the difference in drainage area between the actual gage location and the point where the contributing flow enters the model.
- For those tributaries without available USGS stream gage flow data for the simulation period, EPA set the flow rate equal to the average annual flow rate as per NHDPlus Version 1.
- To simplify the geographic extent of the modeling area, EPA did not model any tributaries with mean annual flow rates of less than 5 cubic feet per second (cfs) as per NHDPlus Version 1.
- EPA used stream gage flow data from the actual time period (*e.g.*, 1982 – 2014) to represent the baseline flow rate in the modeling area. EPA reused the historical flow data to the extent necessary to complete the modeling period through the assumed compliance date (*e.g.*, 2015 – 2020), preferentially selecting flow data from periods that excluded years of particularly high or low flow rates. Then EPA reused the historical flow data to represent the period through the end of the model run (*e.g.*, 2020 – 2036). This approach ensured that the modeling periods before and after the assumed compliance date were based on similar flow data.
- To represent non-steam-electric point sources within the modeling area, EPA assigned the TRI and DMR pollutant loadings to the stream reach (as represented in NHDPlus Version 1) that was closest to the location of the point source.
- EPA used STORET monitoring data, where available, to represent pollutant contributions flowing into the modeling area from upstream point sources, nonpoint sources, and background sources. Prior to incorporation into the WASP model, EPA converted the pollutant concentrations to mass loadings (for all pollutants except TOC and TSS) using the annual average flow rate for the stream segment where the sample was collected (as represented in NHDPlus Version 1). This approach ensured that the modeled pollutant concentrations flowing into the modeling area would vary with changes in the stream flow rate.
- To define initial concentrations for the organic solids, sands, and silts/fines parameters, EPA used TOC and TSS concentrations derived from STORET monitoring data collected within the modeling area.
- EPA calibrated the WASP water quality models by modifying the solids transport input parameters until the modeled pollutant concentrations in the benthic segments closely matched the sediment concentrations derived from STORET monitoring data.

The existing WASP model used for Lake Sinclair already divides the waterbody into segments and an existing Environmental Fluid Dynamics Code (EFDC) model provides hydrodynamics for the lentic system. Using an existing model of a lentic system was a reasonable approach to investigate the regulatory options without developing a detailed model

from scratch. However, this approach does limit the modeling period to the period simulated in the existing EFDC model. Other than these differences, the approach for developing the WASP model for the lentic system was similar to the approach described above for lotic systems.

EPA developed the WASP water quality models (for both lotic and lentic systems) to provide output data for pollutant concentration (total, dissolved, and sorbed) in the water column and benthic segments on a daily output time step. The WASP models generate these outputs for both the immediate receiving water and every downstream segment. As described in Section 8.1.2, EPA then executed the models to represent conditions before and after implementation of the final rule.

Appendix G provides additional information regarding the specific input parameters (*e.g.*, background pollutant concentrations, USGS time series flow data) and model settings (*e.g.*, solids transport parameters) for each of the WASP water quality models. For additional documentation regarding the use or bypassing of specific WASP model features, incorporating stream gage flow and pollutant loadings data, and default settings and assumptions, refer to the *Case Study Water Quality Modeling Memorandum* (DCN SE05570).

8.1.4 Use of WASP Water Quality Model Outputs

For each modeled segment, EPA used the water column and benthic sediment pollutant concentration outputs (for baseline and Option D, both from the WASP model run representing the time period after the assumed compliance date) to perform the following environmental and human health analyses:

- EPA compared the modeled pollutant concentrations in the water column (daily outputs) to the water quality benchmarks listed in Table C-7 of Appendix C and calculated the frequency of exceedances over the entire modeling period (*i.e.*, the percentage of days that have a modeled exceedance).
- EPA compared the modeled pollutant concentrations in the benthic sediment (daily outputs) to the sediment biota chemical stressor concentration limit (CSCL) benchmarks listed in Table D-2 of Appendix D and calculated the frequency of exceedances over the entire modeling period (*i.e.*, the percentage of days with a modeled exceedance).
- EPA compared the modeled pollutant concentrations in the water column (averaged over the entire modeling period) to the water pollutant concentrations that would result in exceedances if used as inputs to the wildlife and human health modules in the IRW model (as described in Section 7.6).

For the Black Creek case study, which had relatively high concentrations of selenium compared to the other selected case studies, EPA also performed ecological risk modeling following the methodology described in Section 5.2.

Using the WASP water quality outputs in these analyses allowed EPA to evaluate, with greater focus and accuracy, the potential for additional environmental and human health impacts that were not reflected in the IRW model outputs. These included impacts associated with peak pollutant concentrations during low-flow periods; long-term accumulation of pollutants in

benthic sediment; impacts in downstream receiving waters; and pollutant contributions from non-steam-electric sources.

8.1.5 Limitations of Case Study Modeling

The results of the case study models are intended to illustrate the types and magnitudes of environmental impacts that are likely to have occurred, and which may continue to occur, in surface waters that receive discharges of the evaluated wastestreams from steam electric power plants. Similarly, the case study modeling results provide valuable information regarding the relative magnitude of water quality improvements predicted for each of the regulatory options.

In developing the case study models, EPA found it necessary to incorporate several assumptions that simplified the modeling approach while introducing uncertainty into the model results. For example, due to a lack of data regarding temporal variability in point source loadings, EPA assumed that the pollutant loadings from steam electric power plants and other point sources are static loadings (*i.e.*, a constant daily average loading rate). This approach does not account for temporal variability in the loadings to receiving waters due to factors such as variable plant operating schedules, storm flows, low-flow events, and catastrophic events. In actuality, steam electric power plants and other point sources could adjust wastewater discharge rates based on stream flow conditions or other considerations. For instance, a plant could reduce discharges during periods of low flow in the receiving water and increase discharges during periods of high flow, resulting in surface water concentrations that differ from what is predicted by the case study model. These assumptions influence the relationship between modeled and actual surface water concentrations at specific locations and times.

Appendix G further discusses the limitations and assumptions made in developing the case study models and describes in more detail the development of each case study model, including input parameters (*e.g.*, pollutant loadings) and model settings. Refer to the *Case Study Water Quality Modeling Memorandum* (DCN SE05570) for discussion of EPA's technical approach and data acceptance criteria to incorporate DMR, TRI, and STORET monitoring data.

8.2 Quantified Environmental Impacts and Improvements from Case Study Modeling

As described in Section 8.1.1, EPA identified six representative case study locations that would capture the types of impacts to surface waters associated with steam electric power plant discharges, capture the improvements expected across the regulatory options, represent the four wastestreams evaluated in the EA, and represent both lentic and lotic systems. Figure 8-1 and Table 8-1 present the six receiving waters that EPA selected for case study modeling.

Section 8.2 introduces each of the six selected case study locations and presents the scope, inputs, and modeling results. For each case study, EPA presents:

- Potential impacts to aquatic life, wildlife, and human health under baseline conditions;
- Improvements to aquatic life, wildlife, and human health following compliance with the final rule; and

- Comparison of the case study and IRW model results for the case study location.

Although EPA modeled the expected environmental improvements under Options A through D, this section primarily presents the water quality, wildlife, and human health improvements under the final rule (Option D). Appendix G of this report includes figures illustrating the water column concentrations output for the immediate receiving water both for baseline conditions and following compliance with the final rule, for those modeled pollutants that exceed one or more water quality benchmarks based on modeling results. These figures present the National Recommended Water Quality Criteria (NRWQC) and Maximum contaminant level (MCL) benchmarks for the modeled pollutant and the steady-state water column concentration results from the IRW model. Appendix G also includes the average total water column concentration for each of the modeled pollutants in WASP model segments downstream of the modeled case study plants.

8.2.1 Black Creek Case Study

Black Creek flows south-southeast through southern Mississippi from Hattiesburg through the De Soto National Forest until it converges with the Pascagoula River. Black Creek is Mississippi's only designated National Wild and Scenic River (for 21 miles) under the National Wild and Scenic Rivers System Act. South Mississippi Electric Power Association's R.D. Morrow, Sr. (Morrow) Generating Site (Plant ID 1185) is a 400-megawatt (MW) coal-fired power plant operating alongside Black Creek near Purvis, Mississippi. Morrow's two stand-alone steam turbine generating units reported producing more than 2,000,000 megawatt-hours (MWh) of electricity in 2009. Based on data obtained from the Steam Electric Survey, Morrow Generating Site discharges FGD wastewater, bottom ash transport water, and combustion residual leachate directly into Black Creek. Table 8-2 contains some general information on the two steam electric generating units at Morrow Generating Site.

Table 8-2. Summary of Morrow Generating Site Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1	Bituminous coal and No. 2 fuel oil	200	Dry conveyed	Wet handled to impoundment	Wet system (1978)
2	Bituminous coal and No. 2 fuel oil	200	Dry conveyed	Wet handled to impoundment	Wet system (1978)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

Modeling Area

The Black Creek WASP model encompasses a 95-mile reach of Black Creek, extending from the Morrow Generating Site discharge outfall on Black Creek to the confluence of Black Creek and Red Creek. The immediate receiving water that Morrow Generating Site discharges to is approximately 1.6 miles long, as defined in the WASP model. This modeling area includes the 21-mile span of the waterway, from Moody's Landing to Fairley Bridge Landing, that is

protected under the National Wild and Scenic River Systems Act. Figure 8-2 illustrates the location and extent of the Black Creek WASP model.

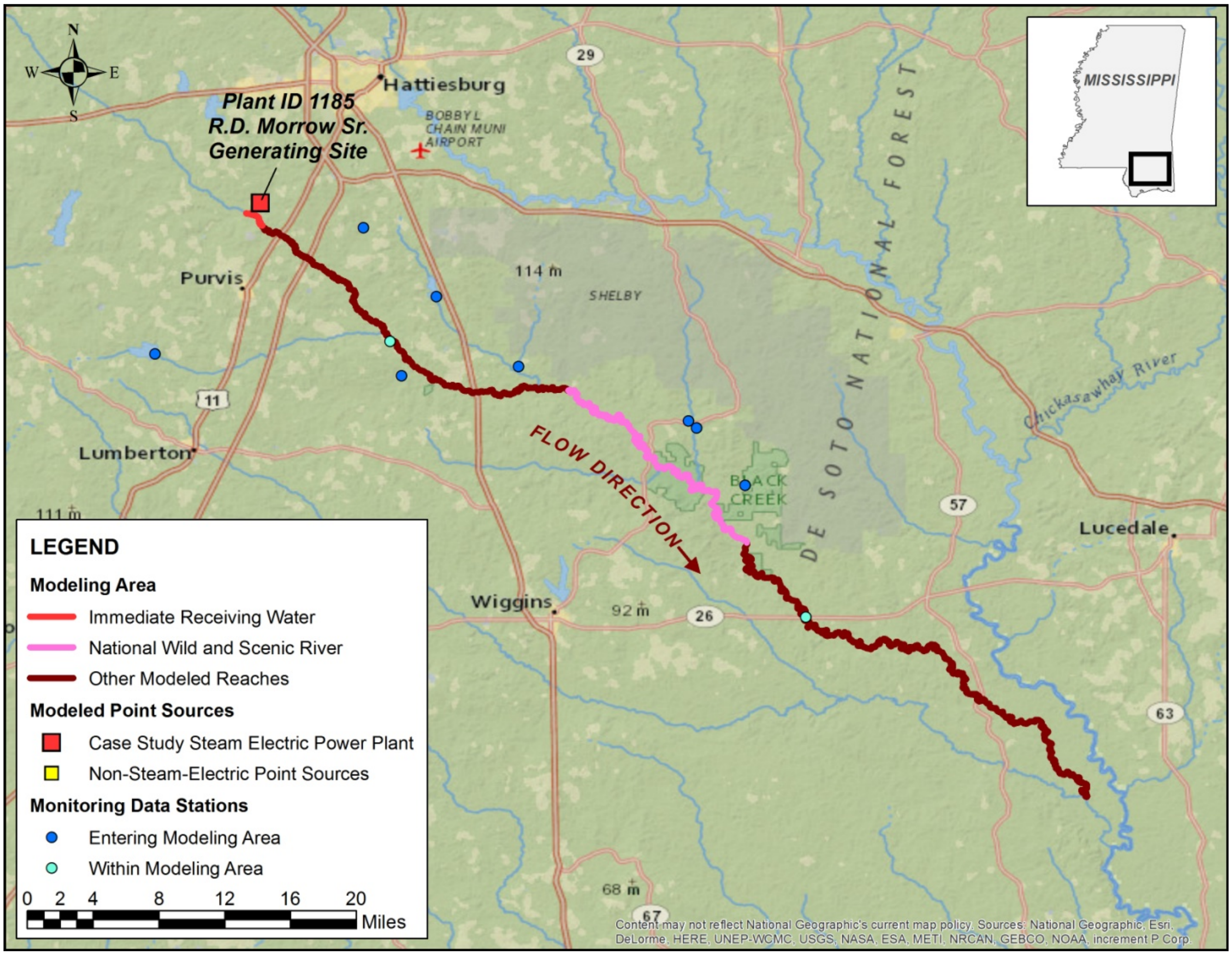


Figure 8-2. Black Creek WASP Modeling Area

<u>Identified Point Sources and Background Concentrations</u>

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Black Creek WASP model to represent pollutant contributions from background and non-steam-electric point sources, and for use in calibrating the model results.

- **Upstream pollutant contributions**. EPA did not identify sufficient STORET monitoring data to represent pollutant contributions from upstream of the Morrow Generating Site immediate receiving water. EPA did not identify any upstream non-steam-electric point sources with loadings for the eight modeled pollutants. EPA therefore assumed pollutant concentrations of zero within the water column at the upstream boundary of the modeling area.
- **Downstream pollutant contributions**. EPA incorporated STORET data from eight monitoring stations to represent the pollutant contributions flowing into the modeling

area downstream of the Morrow Generating Site immediate receiving water (*i.e.*, tributaries flowing into Black Creek). EPA did not identify any non-steam-electric point sources whose pollutant loadings would significantly influence the model results in the downstream modeling area.

- **Monitoring data within the modeling area.** EPA compiled STORET data from two monitoring stations located within the modeling area and used these data to calibrate the WASP model.

Modeling Period

The modeling period starts in 1982 (the year of the last revision to the steam electric ELGs) and extends through 2036, covering a period of 55 years. Based on Morrow Generating Site's NPDES permitting cycle, EPA assumes that the plant will achieve the limitations under the final rule by 2019.

Modeling Results - Water Quality

Under baseline conditions, the modeled pollutant concentrations in the immediate receiving water and downstream reaches exceed the NRWQC water quality benchmarks for four modeled pollutants, indicating that pollutant loadings from the Morrow Generating Site may quantifiably reduce water quality in the modeled portions of Black Creek. The reduced water quality is primarily attributed to arsenic, cadmium, selenium, and thallium. Intervals of higher pollutant concentrations occur during periods of low flow in Black Creek for all eight modeled pollutants.

The baseline modeled pollutant concentrations exceed human health criteria primarily for arsenic, thallium, and selenium, as discussed below:

- Arsenic concentrations in the immediate receiving water exceed the water quality benchmark for consumption of water and organisms (0.018 micrograms per liter (µg/L)) for 99 percent of the modeling period. These exceedances continue downstream, generally at a reduced frequency, throughout the entire 95-mile-long modeling area downstream of the plant.
- Arsenic concentrations in the immediate receiving water also exceed the higher water quality benchmark for consumption of organisms only (0.14 µg/L) for 16 percent of the modeling period. These exceedances continue downstream, at a reduced frequency, throughout the entire 95-mile-long modeling area downstream of the plant.
- Thallium concentrations in the immediate receiving water exceed the water quality benchmark for consumption of water and organisms (0.24 µg/L) for 17 percent of the modeling period. These exceedances continue downstream, at a reduced frequency, throughout the entire 95-mile-long modeling area downstream of the plant.
- Thallium concentrations in the immediate receiving water also exceed the higher water quality benchmark for consumption of organisms only (0.47 µg/L) for 1 percent of the modeling period. These exceedances continue downstream throughout the entire 95-mile-long modeling area downstream of the plant. The frequency of

exceedances downstream ranges from less than 1 percent to 3 percent of the modeling period.

- On rare occasions (less than 1 percent of the modeling period), selenium concentrations in reaches downstream of the immediate receiving water exceed the water quality benchmark for consumption of water and organisms (170 µg/L). These exceedances occur in 5.3 miles of the modeling area downstream of the plant and up to 88 miles downstream of the plant.

These case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms inhabiting these modeled portions of Black Creek could be at an elevated risk of the negative effects associated with oral exposure to these pollutants (see Section 3.1.1).

Aquatic organisms may be at risk for exposure to cadmium and selenium under baseline conditions, as discussed below:

- Cadmium concentrations in the immediate receiving water exceed the freshwater aquatic life criteria for chronic exposure (0.25 µg/L) for 39 percent of the modeling period. These exceedances continue downstream, at a reduced frequency, throughout 28 miles of the modeling area downstream of the plant.
- Selenium concentrations in the immediate receiving water exceed the freshwater aquatic life criteria for chronic exposure (5.0 µg/L) for 43 percent of the modeling period. These exceedances continue downstream throughout the entire 95-mile-long modeling area downstream of the plant. The frequency of exceedances downstream ranges from 2 percent to 51 percent of the modeling period.

These case study modeling results indicate that, under baseline conditions, aquatic organisms inhabiting these modeled portions of Black Creek could be at an elevated risk of the negative effects associated with oral exposure to these pollutants (see Section 3.1.1).

Under baseline conditions, the modeled pollutant concentrations in the immediate receiving water and downstream reaches occasionally exceed the MCL drinking water benchmarks for three modeled pollutants. The baseline modeled pollutant concentrations exceed drinking water criteria for cadmium, selenium, and thallium, as discussed below:

- On rare occasions (less than 1 percent of the modeling period), cadmium concentrations in the immediate receiving water exceed the MCL benchmark (5 µg/L). These exceedances continue downstream throughout the entire 95- mile-long modeling area downstream of the plant. The frequency of exceedances downstream ranges from less than 1 percent to 5 percent of the modeling period.
- On rare occasions (less than 1 percent of the modeling period), selenium concentrations in the immediate receiving water exceed the MCL benchmark (50 µg/L). These exceedances continue downstream, generally at a reduced frequency, in 93 miles of the modeling area downstream of the plant.
- On rare occasions (less than 1 percent of the modeling period), thallium concentrations in downstream reaches of the modeling area exceed the MCL (2

μg/L). These exceedances occur in 8.9 miles of the modeling area downstream of the plant and up to 92 miles downstream of the plant.

Modeling results do not indicate any exceedances of NRWQC or MCL criteria for the other modeled pollutants (copper, nickel, lead, and zinc). Appendix G of this report includes figures that illustrate the water column pollutant concentration output for the immediate receiving water for arsenic, cadmium, selenium, and thallium. These figures also present the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling results show significantly decreased concentrations of all modeled pollutants in the immediate receiving water, which will greatly improve water quality. These pollutant removals result in fewer exceedances of NRWQC and MCL benchmarks compared to those estimated in the baseline modeling. Case study modeling results for Black Creek reveal the following water quality improvements under the final rule:

- For arsenic:
  - Exceedances of the human health water quality benchmark for consumption of water and organisms reduce in frequency from 99 percent to 94 percent of the modeling period in the immediate receiving water. Additionally, the exceedances of this benchmark reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite the continued exceedances of this human health criteria, reducing the pollutant concentrations in the water column may decrease the risk to humans consuming contaminated water and organisms.
  - Exceedances of the human health water quality benchmark for consumption of organisms reduce in frequency from 16 percent to 6 percent of the modeling period in the immediate receiving water. Additionally, the exceedances of this benchmark reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite the continued exceedances of this human health criteria, reducing the pollutant concentrations in the water column may decrease the risk to humans consuming contaminated organisms.
- For cadmium:
  - Exceedances of the aquatic life water quality criteria for chronic impacts are eliminated throughout the entire modeling area.
  - Exceedances of the MCL benchmark are eliminated throughout the entire modeling area.
- For selenium:
  - Exceedances of the human health water quality benchmark for consumption of water and organisms are eliminated throughout the entire modeling area.
  - Exceedances of the MCL benchmark are eliminated throughout the entire modeling area.

- Exceedances of the aquatic life water quality criteria for chronic impacts are eliminated in 13 miles of the modeling area, including the immediate receiving water. The exceedances of this benchmark reduce in frequency to less than 4 percent in all remaining sections of the downstream modeling area following compliance with the final rule. Most of these exceedances occur within the first year following compliance with the final rule (due to the gradual recovery of the system following the pollutant loading removals). Despite the continued exceedances of these human health criteria, reducing the pollutant concentrations in the water column may decrease risk to humans consuming contaminated water and/or organisms.

- For thallium:
  - Exceedances of the MCL benchmark are eliminated throughout the entire modeling area.
  - Exceedances of the human health water quality benchmark for consumption of water and organisms reduce in frequency from 17 percent to less than 1 percent of the modeling period in the immediate receiving water. Additionally, the exceedances of this benchmark reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite the continued exceedances of this human health criteria, reducing the pollutant concentrations in the water column may decrease the risk to humans consuming contaminated water and organisms.
  - Exceedances of the human health water quality benchmark for consumption of organisms are eliminated in 6.2 miles of the modeling area, including the immediate receiving water. Additionally, the exceedances of these benchmarks reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite the continued exceedances of this human health criteria, reducing the pollutant concentrations in the water column may decrease risk to humans consuming contaminated organisms.

Modeling Results – Wildlife

EPA assessed the potential threat to piscivorous wildlife from the evaluated wastestreams by modeling the average pollutant concentrations in the water column and comparing these to the concentrations that would trigger exceedances of no effect hazard concentrations (NEHC) for minks and eagles developed by the USGS. Under baseline conditions, Black Creek may pose a risk to minks and eagles that consume fish contaminated with selenium. The average modeled selenium concentrations in 90 miles of the Black Creek modeling area are greater than the concentration that would translate to NEHC exceedances for minks and eagles, demonstrating that the fish inhabiting these portions of Black Creek may pose a potential reproductive threat to terrestrial food webs.

EPA also assessed the potential impact to wildlife exposed to sediments in surface waters by comparing estimated pollutant concentrations in the sediment to sediment biota CSCL benchmarks. Modeling results demonstrate that cadmium concentrations in the upper benthic sediment of the immediate receiving water exceed the CSCL criteria (0.596 mg/kg) during 36

percent of the modeling period. These exceedances continue downstream for 36 miles of the total modeling area.

Ecological risk modeling results indicate that baseline selenium loadings also present an elevated risk of widespread negative reproductive impacts (larval mortality and deformities) among fish that inhabit the immediate receiving water of Black Creek. The results illustrate the significant increase in risk that can result from minor variations in selenium bioaccumulation patterns and toxicity responses within the organisms that inhabit a particular waterbody. Specifically:

- The median (50^{th} percentile) of the model outputs indicates that selenium concentrations in the fish eggs and ovaries would cause reproductive impacts in less than 1 percent of the exposed fish population.
- However, there is a 35 percent probability that these concentrations are high enough to cause reproductive impacts in more than 30 percent of the exposed fish population.
- There is a 25 percent probability that these concentrations are high enough to cause reproductive impacts in *more than 80 percent* of the exposed fish population.

Ecological risk modeling results also indicate an elevated risk of widespread negative reproductive impacts (hatching failure) among mallards that forage or breed in the immediate receiving water of Black Creek. Specifically:

- There is a 50 percent probability that selenium concentrations in the mallard eggs are high enough to cause reproductive impacts in at least 9 percent of the exposed mallard population.
- There is a 35 percent probability that these concentrations are high enough to cause reproductive impacts in more than 20 percent of the exposed mallard population.
- There is a 10 percent probability that these concentrations are high enough to cause reproductive impacts in *more than 70 percent* of the exposed mallard population.

Elevated risks of reproductive impacts to fish and mallards continue downstream from the immediate receiving water. Ecological risk modeling results indicate that the entire 95-mile modeled length of Black Creek has selenium concentrations that lead to a 10 percent or greater probability of negative reproductive impacts among at least 17 percent of the exposed fish or mallard populations. Additionally, several downstream segments of Black Creek (totaling 29 miles) have selenium concentrations that lead to a 25 percent or greater probability of negative reproductive impacts among at least 10 percent of the exposed mallard population.

The case study modeling results demonstrate that the final rule will significantly reduce pollutant concentrations and the associated impacts to wildlife that inhabit Black Creek. The final rule will eliminate selenium exceedances of the NEHC benchmarks for minks and eagles in all modeled reaches of Black Creek. The final rule will also eliminate CSCL benchmark exceedances for cadmium in 27 miles of the modeling area, including the immediate receiving water. The exceedances of this benchmark reduce in frequency to 3 percent or less in all remaining sections of the downstream modeling area following compliance with the final rule. Most of these remaining exceedances occur within the first year following compliance with the

final rule. Ecological risk modeling results also indicate that the final rule will eliminate the risk of selenium-related adverse reproductive impacts among exposed fish and mallards in all modeled reaches of Black Creek (*i.e.*, the risk to fish and mallards is less than 0.1 percent at the 95th percentile egg/ovary concentration).

Modeling Results – Human Health

EPA evaluated the potential threat to human receptors due to consumption of contaminated fish from Black Creek. EPA modeled the average pollutant concentrations in the water column and compared these to the concentrations that would trigger exceedances of either the non-cancer reference dose or the 1-in-a-million lifetime excess cancer risk (LECR). Under baseline conditions, the average water column concentration of arsenic throughout the modeling area downstream of the plant does not result in an estimated cancer risk greater than 1-in-a-million for any of the national-scale cohorts. See Appendix E for details on the human health module of the IRW model and national-scale cohorts.

Based on the average pollutant concentrations in the water column under baseline conditions, cadmium, selenium, and thallium pose the greatest threat to cause non-cancer health effects in humans from fish consumption, as discussed below:

- Average thallium concentrations in the water column throughout the entire 95-mile-long modeling area are greater than the concentration that would translate to exceedance of the reference doses for at least one child subsistence fisher cohort (with all child subsistence cohorts impacted by 59 or more miles of the modeling area downstream of the plant), while the concentrations in 90 miles of the modeling area are high enough to trigger exceedance of the reference dose for adult subsistence fishers. Additionally, the average thallium concentrations in 59 miles of the modeling area are high enough to trigger exceedance of the reference dose for at least one child recreational fisher cohort.
- Average selenium concentrations in the water column throughout the entire 95-mile-long modeling area are greater than the concentration that would translate to exceedance of the reference dose for the adult subsistence fisher cohorts and at least one child subsistence fisher cohort (with all child subsistence cohorts impacted by 90 or more miles). Additionally, the average selenium concentrations are high enough to trigger exceedances of the reference doses for adult recreational fishers and at least one child recreational fisher cohort in 13 miles and 90 miles of the modeling area, respectively.
- Average cadmium concentrations in the water column in 38 miles of the modeling area are greater than the concentration that would translate to exceedance of the reference dose for at least one child subsistence fisher cohort.

Therefore, humans who consume cadmium-, selenium-, or thallium-contaminated fish inhabiting these waters may be at greater risk for developing the negative health effects associated with these pollutants, which are discussed in Section 3.1.1.

The modeling results demonstrate significant reductions in average water column concentrations of cadmium, selenium, and thallium under the final rule, which would reduce average cadmium and selenium concentrations enough to eliminate the risk for non-cancer health effects for all cohorts throughout the entire modeling area. These loadings reductions would also reduce the thallium concentrations enough to eliminate the risk for non-cancer health effects for adult subsistence and child recreational fishers. While the case study model continues to show average thallium concentrations that may pose non-cancer health effects for at least one child subsistence cohort, the total area of impact is reduced by up to 37 miles (with some child subsistence cohort non-cancer risks being eliminated throughout the entire modeling period downstream of the plant).

Interpretation of Black Creek Results

Case study modeling results for Black Creek indicate greater water quality, wildlife, and human health impacts to the immediate receiving water under baseline conditions than predicted by the IRW model. Case study modeling results for Black Creek also demonstrate water quality benchmark exceedances and risks to wildlife and humans sustaining beyond Morrow Generating Site's immediate receiving water. In some instances, the average water column concentrations can increase in some portions of the downstream modeling area, posing a greater threat to humans, aquatic organisms, and terrestrial ecosystems. This phenomenon is most pronounced for modeled pollutants with the largest partition coefficients (*i.e.*, lead, zinc, cadmium, and copper) suggesting that sediment transport has significant influence in this small receiving water. Under baseline conditions, significant water quality, wildlife, and human health impacts are identified in the modeled area corresponding with 21-mile span of the waterway that is protected under the National Wild and Scenic River Systems Act.

Ecological risk modeling results for the Black Creek case study indicate that the risk of negative reproductive effects among fish and mallards exposed to selenium may be significantly greater than predicted using water quality outputs from the IRW model. Use of the case study water quality outputs, which include extended periods of elevated selenium concentrations that are not reflected in the IRW model outputs, reveals the potential for widespread ecological impacts among wildlife that inhabit, forage, or breed in the immediate receiving water of Black Creek and its downstream waters.

The USGS stream gage flow data used in the case study model indicate that flow rates in Black Creek are typically lower than the annual average flow rate used in the IRW model, while greatly exceeding the annual average flow rate during occasional high-flow events. During the frequent periods of below-average flow, the pollutant concentrations in the modeling area quickly climb to levels associated with negative impacts to fish, wildlife, and humans.

The exceedances identified in the Black Creek WASP model are based solely on discharges of the evaluated wastestreams from the steam electric power plant because EPA did not identify any STORET monitoring data or point sources suggesting any other sources were contributing pollutant discharges to the modeling area. The Black Creek WASP model may be underestimating the pollutant concentrations actually present if there are other discharges that were not captured in the DMR and TRI data sets. Under the final rule, case study modeling of Black Creek indicates that the waterbody will exhibit fewer exceedances of water quality

benchmarks; will no longer pose reproductive risks to higher trophic-level wildlife; will pose less risk to benthic organisms; and will pose less risk to humans consuming fish. The extent of improvements identified by the case study model is greater than what was projected by the IRW model. The decrease of the average pollutant concentrations within the immediate receiving water occurs very quickly after compliance with the final rule; however, some downstream reaches of the modeling area take up to a year to reach equilibrium.

8.2.2 Etowah River Case Study

The Etowah River is a 164-mile-long waterway north of Atlanta, Georgia. The river flows west-southwest from Amicalola Creek, the primary tributary, to Rome, Georgia, where it meets the Oostanaula River and forms the Coosa River at their confluence. Once estimated to have 91 native fish species, the Etowah watershed is biologically one of the richest river systems in North America. Eight imperiled fish species, three of which are federally listed as endangered or threatened, are known to inhabit the Etowah watershed, and five mollusk species are believed to have been decimated [Etowah Aquatic Habitat Conservation Plan, 2015].

Georgia Power Company's Plant Bowen

The Etowah River serves as a source of cooling water for, and receives steam electric wastewater discharges from, Southern Company's Plant Bowen (Plant ID 2244), located in Cartersville, Georgia. In commercial operation since 1975, Plant Bowen is bordered on two sides by the Etowah River and Euharlee Creek. Plant Bowen's four stand-alone steam turbine generating units have a total nameplate capacity of 3,499 MW. As the nation's ninth-largest power plant in net generation of electricity, Plant Bowen reported producing almost 23,000,000 MWh of electricity in 2009 [Georgia Power, 2014]. Based on data EPA obtained in responses to the Steam Electric Survey, Plant Bowen discharges two of the evaluated wastestreams, FGD wastewater and bottom ash transport water, directly to the Etowah River. Table 8-3 contains general information on the four steam electric generating units at Plant Bowen.

In estimating the historical pollutant loadings associated with Plant Bowen's four FGD systems, EPA incorporated the pollutant loadings from FGD wastewater as the systems were installed, between 2008 and 2011. EPA did not model any FGD wastewater pollutant loadings before the installation of Plant Bowen's first FGD system.

Table 8-3. Summary of Plant Bowen Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1	Bituminous coal and No. 2 fuel oil	806	Dry conveyed	Wet handled to impoundment	Wet system (2010)
2	Bituminous coal and No. 2 fuel oil	789	Dry conveyed	Wet handled to impoundment	Wet system (2009)
3	Bituminous coal and No. 2 fuel oil	952	Dry conveyed	Wet handled to impoundment	Wet system (2008)
4	Bituminous coal and No. 2 fuel oil	952	Dry conveyed	Wet handled to impoundment	Wet system (2008)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

Modeling Area

The Etowah River WASP model encompasses a 35-mile segment of the Etowah River, extending from the immediate receiving water to the confluence of the Etowah River and Silver Creek. The immediate receiving water to which Plant Bowen discharges is approximately 3.6 miles long, as defined in the WASP model. Figure 8-3 illustrates the location and extent of the Etowah River WASP model.

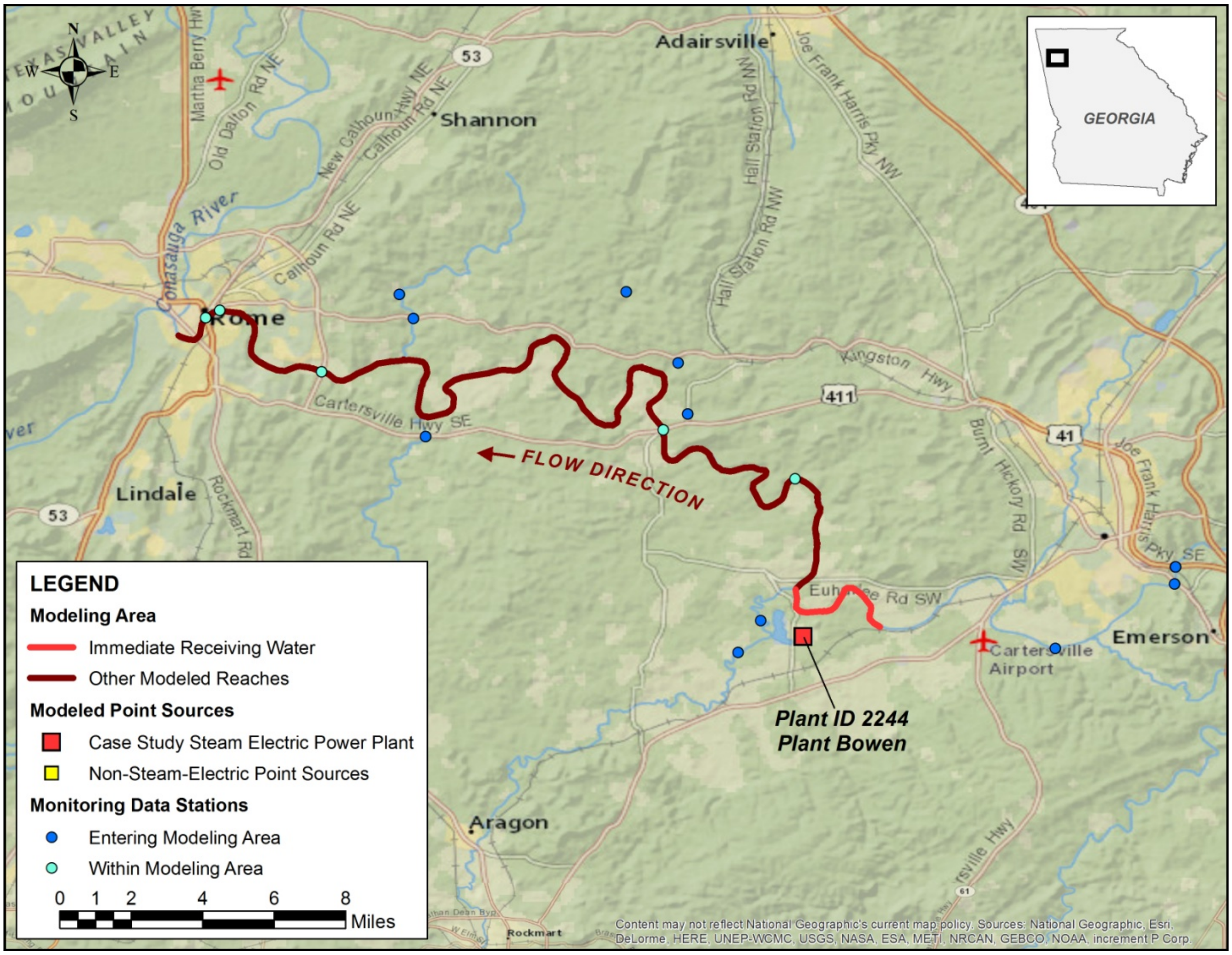


Figure 8-3. Etowah River WASP Modeling Area

Identified Point Sources and Background Concentrations

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Etowah River WASP model to represent pollutant contributions from background and non-steam-electric point sources, and for use in calibrating the model results.

- **Upstream pollutant contributions**. EPA incorporated STORET data from four monitoring stations to represent the pollutant contributions from upstream of the Plant Bowen immediate receiving water. EPA also identified two upstream non-steam-electric point sources whose pollutant loadings (from DMR and TRI data sets) could influence the model results; however, EPA assumed that the STORET data from the four monitoring stations (which encompass all of the modeled pollutants except for selenium) adequately reflect the pollutant contributions from upstream point sources. Therefore, EPA did not incorporate pollutant loadings from the two identified upstream non-steam-electric point sources.

- **Downstream pollutant contributions**. EPA incorporated STORET data from 10 monitoring stations to represent the pollutant concentrations flowing into the modeling area downstream of the Plant Bowen immediate receiving water (*i.e.*, tributaries flowing into the Etowah River). EPA did not identify any non-steam-electric point sources whose pollutant loadings would significantly influence the model results in the downstream modeling area.
- **Monitoring data within the modeling area**. EPA compiled STORET data from six monitoring stations located within the modeling area and used these data to calibrate the WASP model.

The contributions of arsenic, cadmium, copper, lead, and thallium from upstream sources have a much greater influence on the modeled pollutant concentrations in the Etowah River than the pollutant loadings from Plant Bowen. The contributions of nickel and zinc from upstream sources also strongly influence the modeled pollutant concentrations in the Etowah River.

The Etowah River case study model did not account for the documented surface water impacts from Plant Bowen that are discussed in Section 3.3.3. In 2002, a sinkhole developed in the surface impoundment at Plant Bowen that released 2.25 million gallons of ash/water mixture, estimated to contain 80 tons of ash, to Euharlee Creek, which immediately flows into the Etowah River [U.S. EPA, 2014b]. Additionally, an extreme rainfall event in 2008 caused a dry ash stockpile to collapse, depositing approximately two tons of ash in Euharlee Creek. The surface water quality impacts resulting from these events are not reflected in this model; therefore, the case study modeling could under-represent the actual baseline impacts of Plant Bowen on the Etowah River.

Modeling Period

The modeling period starts in 1982 (the year of the last revision to the steam electric ELGs) and extends through 2032, covering a period of 51 years. Based on Plant Bowen's NPDES permitting cycle, EPA assumes that the plant will achieve the limitations under the final rule by 2021.

Modeling Results – Water Quality

Under baseline conditions, the modeled pollutant concentrations in the immediate receiving water and downstream reaches exceed the NRWQC water quality benchmarks for five modeled pollutants, indicating that pollutant loadings from Plant Bowen may contribute to a quantifiable reduction in water quality in the modeled portions of the Etowah River. The reduced water quality is primarily attributed to arsenic, cadmium, selenium, thallium, and lead.

The baseline modeled water concentrations exceed human health criteria primarily for arsenic and thallium, as discussed below:

- Arsenic concentrations in the immediate receiving water exceed the water quality benchmark for consumption of water and organisms (0.018 µg/L) for the entire modeling period. These exceedances continue downstream, at the same frequency, throughout the entire 35-mile-long modeling area downstream of the plant.

- Arsenic concentrations in the immediate receiving water also exceed the higher water quality benchmark for consumption of organisms only (0.14 µg/L) for the entire modeling period. These exceedances continue downstream, at the same frequency, throughout the entire 35-mile-long modeling area downstream of the plant.
- Thallium concentrations in the immediate receiving water exceed the water quality benchmarks for consumption of water and organisms (0.24 µg/L) for more than 99 percent of the modeling period. These exceedances continue downstream, at an increased frequency, throughout the entire 35-mile-long modeling area downstream of the plant.
- Thallium concentrations in the immediate receiving water also exceed the higher water quality benchmark for consumption of organisms only (0.47 µg/L) for 90 percent of the modeling period. These exceedances continue downstream, at an increased frequency, throughout the entire 35-mile-long modeling area downstream of the plant.

These case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms inhabiting these modeled portions of the Etowah River may be more at risk of the negative effects associated with oral exposure to arsenic and thallium (see Section 3.1.1).

Aquatic organisms may be at risk for exposure to cadmium and selenium under baseline conditions, specifically:

- Cadmium concentrations in the immediate receiving water exceed the freshwater aquatic life criteria for chronic exposure (0.25 µg/L) for 52 percent of the modeling period. These exceedances continue downstream throughout the 35-mile-long modeling area downstream of the plant. The frequency of exceedances downstream ranges from 33 percent to 55 percent of the modeling period.
- On rare occasions (less than 1 percent of the modeling period), selenium concentrations in downstream reaches of the modeling area exceed the freshwater aquatic life criteria for chronic exposure (5 µg/L). These exceedances occur in 4.7 miles of the downstream modeling area downstream of the plant and up to 35 miles downstream of the plant.

These modeling results indicate that, under baseline conditions, aquatic organisms residing in the portions of the Etowah River with modeled exceedances may be more at risk to negative impacts from chronic exposure to cadmium and selenium.

Under baseline conditions, the modeled pollutant concentrations in the immediate receiving water and downstream reaches exceed the MCL drinking water benchmarks for four modeled pollutants. The baseline modeled pollutant concentrations exceed drinking water criteria for thallium, arsenic, cadmium and lead as discussed below:

- Thallium concentrations in the immediate receiving water exceed the MCL benchmark (2 µg/L) for 29 percent of the modeling period. These exceedances

continue downstream, at a reduced frequency, throughout the entire 35-mile-long modeling area downstream of the plant.

- On rare occasions (less than 1 percent of the modeling period), arsenic concentrations in the immediate receiving water exceed the MCL benchmark (10 µg/L). These exceedances do not occur beyond the 3.6-mile-long immediate receiving water.
- On rare occasions (less than 1 percent of the modeling period), cadmium concentrations in downstream reaches of the modeling area exceed the MCL benchmark (5 µg/L). These exceedances occur in 5.1 miles of the downstream modeling area downstream of the plant and up to 35 miles downstream of the plant.
- On rare occasions (less than 1 percent of the modeling period), lead concentrations in downstream reaches of the modeling area exceed the MCL benchmark (15 µg/L). These exceedances occur in 5.1 miles of the downstream modeling area downstream of the plant and up to 35 miles downstream of the plant.

Modeling results do not indicate any exceedances of NRWQC or MCL criteria for the other modeled pollutants (copper, nickel, and zinc). Appendix G of this report includes figures that illustrate the water column pollutant concentration output for the immediate receiving water for arsenic, cadmium, selenium, and thallium. These figures also present the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling results show a significant reduction in selenium concentrations and moderately decreased concentrations of cadmium, nickel, and zinc within the Etowah River, which will improve water quality. These pollutant removals result in fewer exceedances of NRWQC and MCL benchmarks compared to those estimated in the baseline modeling. Case study modeling results for the Etowah River reveal the following water quality improvements under the final rule:

- Exceedances of the cadmium aquatic life water quality criteria for chronic impacts reduce in frequency (by 13 percent) in the immediate receiving water. Additionally, the exceedances of these benchmarks reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite continued exceedances of these aquatic life criteria, reducing the pollutant concentrations in the water column may decrease the risk to aquatic life in the Etowah River.
- Exceedances of the selenium aquatic life water quality criteria for chronic impacts are eliminated throughout the entire modeling area.

While case study modeling results continue to show exceedances for NRWQC benchmark exceedances of arsenic and thallium and MCL benchmark exceedances of arsenic, cadmium, lead, and thallium, the final rule will reduce loading contributions of these pollutants from Plant Bowen.

Modeling Results – Wildlife

Based on the average pollutant concentrations in the water column under baseline conditions, the modeled portion of the Etowah River does not exceed the concentrations that would translate to NEHC exceedances and does not pose a risk to minks and eagles that consume contaminated fish. Despite the modeling not being able to quantify any improvements to minks and eagles under the final rule, the pollutant loading removals will decrease bioaccumulation of toxic pollutants in the terrestrial food chains.

Modeling results do not indicate that there are any pollutant concentrations in the upper benthic sediment that exceed CSCL benchmarks of for any of the eight modeled pollutants; therefore, the Etowah River does not pose a threat to benthic organisms in contact with contaminated sediment. Despite the modeling not being able to quantify any improvements to benthic organisms under the final rule, the pollutant loading removals will decrease the concentrations of toxic pollutants in benthic sediment and decrease the exposure of organisms to these pollutants.

Modeling Results – Human Health

EPA modeled the average pollutant concentrations in the water column and compared these to the concentrations that would trigger exceedances of either the non-cancer reference dose or the 1-in-a-million lifetime excess cancer risk (LECR). Under baseline conditions, the average water column concentration of arsenic in the immediate receiving water over the modeling period results in an estimated cancer risk greater than 1-in-a-million for adult subsistence fishers. These exceedances do not occur beyond the 3.6-mile-long immediate receiving water. Therefore, adults who frequently consume arsenic-contaminated fish inhabiting the immediate receiving water may be at greater risks for development of cancer. Modeling results demonstrate no reduction in the cancer risk from inorganic arsenic under the final rule.

Based on the average pollutant concentrations in the water column under baseline conditions, selenium and thallium pose the greatest threat to cause non-cancer health effects in humans from fish consumption, as discussed below:

- Average selenium concentrations in the immediate receiving water are greater than the concentrations that would translate to exceedance of the reference doses for the child (younger than 11 years old) subsistence fisher cohorts. The average selenium concentrations throughout the entire 35-mile-long modeling area downstream of the plant are greater than the concentration that would translate to an exceedance of the reference dose for least one child subsistence cohort.
- Average thallium concentrations in the water column throughout the entire 35-mile-long modeling area downstream of the plant are greater than the concentrations that would translate to exceedance of the reference doses for adult and children recreational and subsistence fishers (all national-scale cohorts evaluated).

Therefore, humans who consume selenium- or thallium-contaminated fish inhabiting the modeled area of the Etowah River may be at greater risk for developing the negative health effects associated with these pollutants, which are discussed in Section 3.1.1.

The final rule modeling results demonstrate significant reductions in selenium concentrations in the Etowah River, which will eliminate selenium exceedances of the non-cancer health effects reference dose for all cohorts. While the modeling results continue to show thallium water concentrations that would translate to exceedances of the non-cancer health effects reference dose, the final rule will reduce thallium loading contributions from Plant Bowen.

Interpretation of Etowah River Results

Case study modeling results for the Etowah River indicate greater water quality and human health impacts than predicted by the IRW model (IRW modeling results did not indicate any quantifiable impacts in the immediate receiving water of Plant Bowen). By accounting for background pollutant contributions from upstream sources and other boundaries (for all modeled pollutants except selenium), case study modeling predicts higher pollutant concentrations under baseline conditions. For arsenic and thallium, and to a lesser extent cadmium, the projected exceedances are driven by the background concentrations flowing into the Etowah River modeling area. Plant Bowen's discharges of the evaluated wastestreams may be further impairing the degraded waterway.

Case study modeling results for the Etowah River also demonstrate water quality benchmark exceedances and risks to humans occur beyond Plant Bowen's immediate receiving water. In some instances, the average water column concentrations can increase in some portions of the downstream modeling area, posing a greater threat to humans and aquatic life. This phenomenon is most pronounced for modeled pollutants with the largest partition coefficients (*i.e.*, lead, zinc, cadmium, and copper), suggesting that sediment transport has moderate influence in the Etowah River.

Case study modeling of the Etowah River indicates that, under the final rule, the Etowah River will exhibit fewer exceedances of water quality benchmarks and pose less risk to humans consuming fish that inhabit these waters. The improvements identified by the case study model are more extensive than what was projected by the IRW model. This is due in part to the greater water quality and human health impacts under baseline conditions, which created additional opportunities for modeled improvements, and in part to the identified improvements in downstream reaches of the Etowah River that were not evaluated as part of the IRW model. The average pollutant concentrations throughout the entire modeling area reduce promptly after compliance with the final rule.

8.2.3 Lick Creek & White River Case Study

The White River is a two-forked river that primarily flows southwest through central and southern Indiana. The two forks, the West Fork and the East Fork, are nearly equal in size when they converge in Daviess Country, just north of Petersburg, Indiana. From this confluence, the White River flows west-southwest for 50 river-miles until it joins the Wabash River at the Illinois-Indiana state border. Located on the banks of the lower White River, Indianapolis Power & Light's (IPL) Petersburg Generating Station (Plant ID 3997) has four stand-alone steam turbine units with a nameplate capacity of 1,864 MW. The plant reported that these four coal-fired generating units produced more than 12,000,000 MWh of electricity in 2009 in the Steam

Electricity Survey. Petersburg Generating Station also operates three minor oil-burning internal combustion units, which are exempt from the requirements of the final rule. Based on data obtained in responses to the Steam Electric Survey, this power plant discharges FGD wastewater and bottom ash transport water. Table 8-4 contains general information on the four coal-fired generating units at Petersburg Generating Station.

In estimating the historical pollutant loadings associated with Petersburg Generating Station's four FGD systems, EPA incorporated the pollutant loadings from FGD wastewater as the systems were installed, between 1977 and 1996. EPA included the pollutant loadings from the FGD systems on units 3 and 4 at the start of the historical modeling period (1986).

IPL's Petersburg Generating Station

Table 8-4. Summary of Petersburg Generating Station Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash [a]	Bottom Ash	FGD (Year Installed)
1	Subbituminous coal and No. 2 fuel oil	255	Dry conveyed	Wet handled to impoundment	Wet system (05/1996)
2	Subbituminous coal and No. 2 fuel oil	445	Dry conveyed	Wet handled to impoundment	Wet system (05/1996)
3	Subbituminous coal and No. 2 fuel oil	580	Dry conveyed	Wet handled to impoundment	Wet system (11/1977)
4	Subbituminous coal and No. 2 fuel oil	584	Dry conveyed	Wet handled to impoundment	Wet system (04/1986)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

a – Based on EPA projections, Petersburg Generating Station will convert to dry ash handling to comply with the CCR rulemaking.

Modeling Area

Based on data obtained in responses to the Steam Electric Survey, Petersburg Generating Station discharges FGD wastewater and bottom ash transport water to Lick Creek, a 1.8-mile-long tributary emptying into the White River. The White River WASP model encompasses Lick Creek and a 52-mile reach of the White River, 49 miles of which is downstream of Lick Creek. The immediate receiving water, Lick Creek, is the first of three upstream modeling boundaries for this WASP model. The other upstream model boundaries are on the West Fork White River and East Fork White River approximately one mile upstream of their confluence. EPA extended the modeling area upstream of Lick Creek to capture and incorporate available STORET monitoring data as further described below. The Lick Creek and White River WASP model ends

at the confluence of the White River with the Wabash River. Figure 8-4 illustrates the location and extent of the White River WASP model.

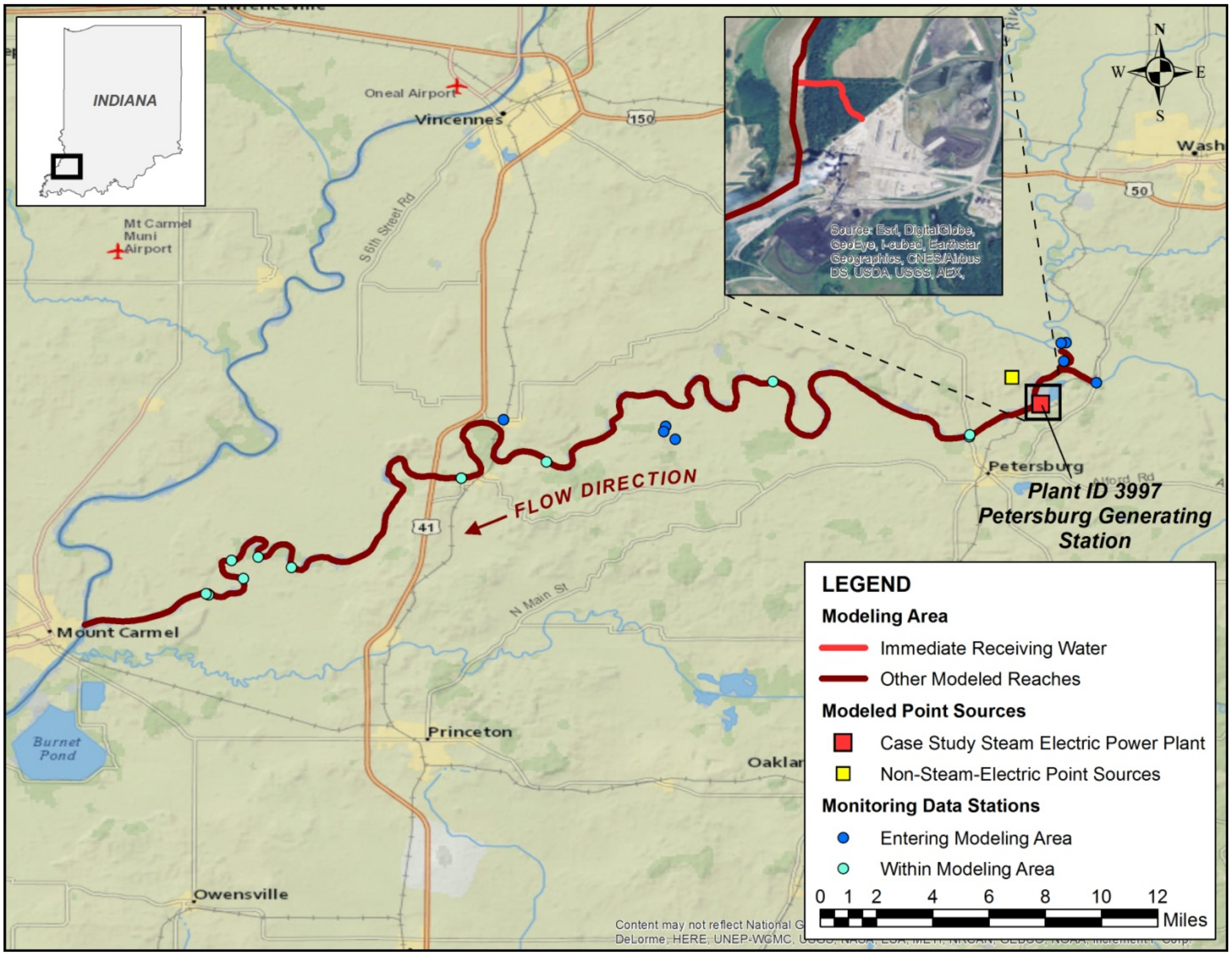


Figure 8-4. Lick Creek and White River WASP Modeling Area

Identified Point Sources and Background Concentrations

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Lick Creek and White River WASP model to represent pollutant contributions from background and non-steam-electric point sources, and for use in calibrating the model results.

- **Upstream pollutant contributions (Lick Creek)**. EPA did not identify sufficient STORET monitoring data to represent pollutant contributions from upstream of the Petersburg Generating Station immediate receiving water (Lick Creek). EPA did not identify any upstream non-steam-electric point sources with loadings for the eight modeled pollutants on Lick Creek. EPA therefore assumed pollutant concentrations of zero within the water column at the upstream boundary of the modeling area.
- **Upstream pollutant contributions (West Fork White River)**. EPA incorporated STORET data from three monitoring stations to represent the pollutant contributions

from upstream on the west fork of the White River. EPA also identified three upstream non-steam-electric point sources whose pollutant loadings (from DMR and TRI data sets) could influence the model results; however, EPA assumed that the STORET monitoring data (which include all of the modeled pollutants except for thallium) adequately reflect the pollutant contributions from upstream point sources. Similarly, EPA identified that a steam electric power plant, Edwardsport Generating Station (Plant ID 8544), has historically discharged to the west fork of the White River 30 miles upstream of the start boundary. Edwardsport Generating Station discontinued operation of all steam electric generating units in 2011 to construct a new integrated gasification combined cycle power plant. EPA assumed that the STORET monitoring data adequately reflect the pollutant contributions from this point source. Therefore, EPA did not incorporate pollutant loadings from the three identified upstream non-steam-electric point sources or Edwardsport Generating Station into the WASP model.

- **Upstream pollutant contributions (East Fork White River)**. EPA incorporated STORET data from one monitoring station to represent the pollutant contributions from upstream on the east fork of the White River. EPA also identified one upstream non-steam-electric point source whose pollutant loadings (from DMR and TRI data sets) could influence the model results; however, EPA assumed that the STORET monitoring data (which include all of the modeled pollutants) adequately reflect the pollutant contributions from upstream point sources. Therefore, EPA did not incorporate pollutant loadings from this identified upstream non-steam-electric point source in the WASP model.
- **Downstream pollutant contributions**. EPA incorporated STORET data from four monitoring stations to represent the pollutant concentrations flowing into the modeling area downstream of the Petersburg Generating Station immediate receiving water, Lick Creek (*i.e.*, tributaries flowing into the White River). EPA did identify one non-steam-electric point source that discharges one or more of the modeled pollutants within the modeling area. EPA incorporated the pollutant loadings from the identified non-steam-electric point source into the model.
- **Monitoring data within the modeling area.** EPA compiled STORET data from 12 monitoring stations located within the modeling area and used these data to calibrate the WASP model.

The contributions of arsenic, cadmium, copper, nickel, lead, and zinc from upstream sources have a much greater influence on the modeled pollutant concentrations in White River than the pollutant loadings from Petersburg Generating Station.

Due to the lack of pollutant loadings data, the White River case study model did not account for the ground water impacts from Petersburg Generating Station associated with the damage case listed in Appendix A. In 1997, the catastrophic release of coal combustion residuals degraded the quality of ground water and surface water around the plant.

The White River case study model does not account for pollutant loadings from Hoosier Energy's Frank E. Ratts (Ratts) Generating Station (Plant ID 2314), a 232-MW steam electric power plant located less than a mile downstream of Petersburg Generating Station. Based on

information obtained in responses to the Steam Electric Survey, Ratts Generating Station discharged one or more of the evaluated wastestreams directly to the White River. This plant, however, has publicly announced plans to retire all of its steam generating units prior to implementation of the final rule. EPA therefore excluded pollutant loadings from the Ratts Generating Station so that the changes in pollutant loadings during the modeling period, and the associated environmental improvements, reflect only those attributable to the final rule.

Modeling Period

The modeling period starts in 1986 (the year the last generating unit at Petersburg Generating Station began operating) and extends through 2034, covering a period of 49 years. Based on Petersburg Generating Station's NPDES permitting cycle, EPA assumes that the plant will achieve the limitations under the final rule by 2019.

Modeling Results – Water Quality

Under baseline conditions, the modeled pollutant concentrations in Lick Creek, the immediate receiving water exceed NRWQC water quality benchmarks for five modeled pollutants, indicating that pollutant loadings from the Petersburg Generating Station may quantifiably reduce water quality in the modeled portions of Lick Creek. Additionally, the modeled pollutant concentrations in portions of the White River downstream of Lick Creek exceed NRWQC water quality benchmarks for four of the modeled pollutants, indicating that the water quality downstream of Lick Creek may also be reduced by the pollutant loadings form Petersburg Generating Station.

The baseline modeled pollutant concentrations exceed human health criteria primarily for arsenic, thallium, and selenium, as discussed below:

- Arsenic concentrations in Lick Creek exceed the water quality benchmark for consumption of water and organisms (0.018 µg/L) for the entire modeling period. These exceedances continue downstream in the White River, at the same frequency, throughout the entire 50-mile-long modeling area downstream of the plant.
- Arsenic concentrations in Lick Creek also exceed the higher water quality benchmark for consumption of organisms only (0.14 µg/L) for the entire modeling period. These exceedances continue downstream in the White River, generally at the same frequency, throughout the entire 50-mile-long modeling area downstream of the plant.
- Thallium concentrations in Lick Creek exceed the water quality benchmarks for consumption of water and organisms (0.24 µg/L) for the entire modeling period. These exceedances continue downstream in the White River, at a much lower frequency (less than 2 percent of the modeling period), throughout the entire 50-mile-long modeling area downstream of the plant.
- Thallium concentrations in Lick Creek also exceed the higher water quality benchmark for consumption of organisms only (0.47 µg/L) for the entire modeling period. On rare occasions (less than 1 percent of the modeling period), thallium concentrations in reaches downstream in the White River also exceed this benchmark.

These downstream exceedances occur in 26 miles of the modeling area downstream of the plant and up to 31 miles downstream of the plant.

- On rare occasions (less than 1 percent of the modeling period), selenium concentrations in Lick Creek exceed the water quality benchmark for consumption of water and organisms (170 µg/L). These exceedances do not occur downstream after the confluence of the Lick Creek and White River.

These case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms inhabiting these modeled portions of Lick Creek and the White River may be more at risk of the negative effects associated with oral exposure to these pollutants (see Section 3.1.1).

Aquatic organisms may be at risk for exposure to copper, selenium, and cadmium under baseline conditions, as discussed below:

- Copper concentrations in Lick Creek exceed the freshwater aquatic life criteria for chronic exposure (9.0 µg/L) for 45 percent of the modeling period. These exceedances do not occur downstream after the confluence of the Lick Creek and White River.
- Copper concentrations in Lick Creek also exceed the higher freshwater aquatic life criteria for acute exposure (13 µg/L) for 25 percent of the modeling period. These exceedances do not occur downstream after the confluence of the Lick Creek and White River.
- Selenium concentrations in Lick Creek exceed the freshwater aquatic life criteria for chronic exposure (5.0 µg/L) for 99 percent of the modeling period. On rare occasions (less than 1 percent of the modeling period), selenium concentrations in reaches downstream in the White River also exceed this benchmark. These downstream exceedances occur in 21 miles of the modeling area downstream of the plant and up to 32 miles downstream of the plant.
- Cadmium concentrations in Lick Creek exceed the freshwater aquatic life criteria for chronic exposure (0.25 µg/L) for 86 percent of the modeling period. On rare occasions (less than 1 percent of the modeling period), cadmium concentrations in reaches downstream in the White River also exceed this benchmark. These downstream exceedances occur in 18 miles of the modeling area downstream of the plant.

These modeling results indicate that, under baseline conditions, aquatic organisms residing in the portions of Lick Creek and the White River with modeled exceedances may be more at risk to negative impacts from chronic exposure to cadmium and selenium. Additionally, the copper loadings from Petersburg Generating Station may pose a threat from chronic or acute exposure.

Under baseline conditions, the modeled pollutant concentrations in Lick Creek and downstream reaches in the White River exceed the MCL drinking water benchmarks for five

modeled pollutants. The baseline modeled pollutant concentrations exceed drinking water criteria for thallium, selenium, arsenic, lead, and cadmium as discussed below:

- Thallium concentrations in Lick Creek exceed the MCL benchmark (2 µg/L) for 96 percent of the modeling period. These exceedances do not occur downstream after the confluence of the Lick Creek and White River.
- Selenium concentrations in Lick Creek exceed the MCL benchmark (50 µg/L) for 38 percent of the modeling period. These exceedances do not occur downstream after the confluence of the Lick Creek and White River.
- Arsenic concentrations in Lick Creek exceed the MCL benchmark (10 µg/L) for 34 percent of the modeling period. These exceedances occur in 8.0 miles of the modeling area downstream of the plant and up to 35 miles downstream of the plant.
- On rare occasions (less than 1 percent of the modeling period), lead concentrations in Lick Creek exceed the MCL benchmark (15 µg/L). These exceedances continue to occur downstream in 24 miles of the White River as far as the end of the model (50 miles downstream of the plant discharge).
- On rare occasions (less than 1 percent of the modeling period), cadmium concentrations in Lick Creek exceed the MCL benchmark (0.25 µg/L). These exceedances do not occur downstream after the confluence of the Lick Creek and White River.

Modeling results do not indicate any exceedances of NRWQC or MCL criteria for nickel or zinc. Appendix G of this report includes figures that illustrate the water column pollutant concentration output for the immediate receiving water for arsenic, cadmium, copper, lead, selenium, and thallium. These figures also present the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling results show significantly decreased concentrations of all modeled pollutants in the immediate receiving water (Lick Creek), which will greatly improve water quality. The final modeling results also demonstrate that the reduction of pollutant loadings from Petersburg Generating Station will significantly reduce the concentrations of selenium and thallium in the White River, downstream of Lick Creek. These pollutant removals result in fewer exceedances of NRWQC and MCL benchmarks compared to those estimated in the baseline modeling. Case study modeling results for Lick Creek and the White River reveal the following water quality improvements under the final rule:

- For arsenic:
  - Exceedances of the MCL benchmark are eliminated in Lick Creek. Despite the continued exceedances of this benchmark, at the same frequency, downstream in the White River, reducing the pollutant concentrations in the water column may decrease the human health risk.
  - Exceedances of the human health water quality benchmark for consumption of organisms reduce in frequency from 100 percent to 87 percent of the modeling

period in Lick Creek. Despite the continued exceedances of this human health criteria, at the same frequency, downstream in the White River, reducing the pollutant concentrations in the water column may decrease the risk to humans consuming contaminated organisms.

- For cadmium:
  - Exceedances of the aquatic life water quality criteria for chronic impacts are eliminated throughout the entire modeling area.
  - Exceedances of the MCL benchmark (observed only in Lick Creek under baseline conditions) are eliminated throughout the entire modeling area.
- For copper:
  - Exceedances of the aquatic life water quality criteria for chronic and acute impacts (observed only in Lick Creek under baseline conditions) are eliminated throughout the entire modeling area.
- For lead:
  - Exceedances of the MCL benchmark are eliminated in Lick Creek. Despite the continued exceedances of this benchmark, at the same frequency, downstream in the White River, reducing the pollutant concentrations in the water column may decrease the human health risk.
- For selenium:
  - Exceedances of the aquatic life water quality criteria for chronic impacts are eliminated throughout the entire modeling area.
  - Exceedances of the human health water quality benchmark for consumption of water and organisms (observed only in Lick Creek under baseline conditions) are eliminated throughout the entire modeling area.
  - Exceedances of the MCL benchmark (observed only in Lick Creek under baseline conditions) are eliminated throughout the entire modeling area.
- For thallium:
  - Exceedances of the MCL benchmark reduce in frequency from 96 percent to less than 1 percent of the modeling period in Lick Creek.
  - Exceedances of the human health water quality benchmark for consumption of water and organisms reduce in frequency from 100 percent to 84 percent of the modeling period in Lick Creek. Exceedances of this benchmark are eliminated through the modeling area downstream of the immediate receiving water (after the confluence of the Lick Creek and White River).
  - Exceedances of the human health water quality benchmark for consumption of organisms reduce in frequency from 100 percent to 61 percent of the modeling period in Lick Creek. Exceedances of this benchmark are eliminated through the modeling area downstream of the immediate receiving water (after the confluence of the Lick Creek and White River).

The final rule modeling results demonstrate that, due to background concentrations of arsenic from upstream sources, there will still be exceedances of the human health water quality benchmark for consumption of water and organisms throughout the entire modeling area downstream of the plant; however, the final rule will reduce the arsenic loadings that the Petersburg Generating Station contributes to the White River.

Modeling Results – Wildlife

Under baseline conditions, Lick Creek may pose a risk to minks and eagles that consume fish contaminated with selenium. The average modeled selenium concentration in Lick Creek is more than 18 times greater than the concentration that would translate to NEHC exceedances for minks and eagles, demonstrating that this portion of the immediate receiving water may pose a potential reproductive threat to terrestrial food webs. The water concentrations downstream after the confluence of the Lick Creek and White River do not pose a threat to these indicator species.

Modeling results indicate that on rare occasions (less than 1 percent of the modeling period), nickel concentrations in benthic sediment downstream reaches exceed the CSCL benchmark (18 mg/kg). These exceedances occur in 3.0 miles of the modeling area downstream of the plant and up to 35 miles downstream of the plant.

The case study modeling results demonstrate that the final rule will significantly reduce pollutant concentrations and the associated impacts to wildlife that inhabit Lick Creek. The final rule will eliminate selenium exceedances of the NEHC benchmarks for minks and eagles in all modeled reaches of Lick Creek. Despite the modeling not being able to quantify any improvements to benthic organisms under the final rule, the pollutant loading removals will decrease the concentrations of toxic pollutants in benthic sediment and decrease the exposure of organisms to these pollutants.

Modeling Results – Human Health

EPA modeled the average pollutant concentrations in the water column and compared these to the concentrations that would trigger exceedances of either the non-cancer reference dose or the 1-in-a-million LECR. Under baseline conditions, the average water column concentration of arsenic in the immediate receiving water over the modeling period results in an estimated cancer risk of approximately 3-in-a-million for adult subsistence fishers. Therefore, adults who frequently consume arsenic-contaminated fish inhabiting the immediate receiving water may be at greater risks for development of cancer.

Based on the average pollutant concentrations in the water column under baseline conditions, cadmium, selenium, and thallium pose the greatest threat to cause non-cancer health effects in humans from fish consumption, as discussed below:

- Average thallium concentrations in Lick Creek are significantly greater than the concentrations that would translate to exceedances of the reference doses for adult and children recreational and subsistence fishers (all national-scale cohorts evaluated), with some cohorts potentially being exposed to concentrations more than 200 times the reference dose. The water concentrations downstream after the

confluence of the Lick Creek and White River do not pose a threat to any of the evaluated cohorts.

- Average selenium concentrations in Lick Creek are greater than the concentration that would translate to exceedances of the reference doses for adult and children recreational and subsistence fishers (all national-scale cohorts evaluated). The water concentrations downstream after the confluence of the Lick Creek and White River do not pose a threat to any of the evaluated cohorts.
- Average cadmium concentrations in Lick Creek are greater than the concentration that would translate to exceedances of the reference doses for the child (younger than 11 years old) subsistence fisher cohorts. The water concentrations downstream after the confluence of the Lick Creek and White River do not pose a threat to any of the evaluated cohorts.

Therefore, humans who consume thallium-, selenium-, or cadmium-contaminated fish inhabiting Lick Creek may be at greater risk for developing the negative health effects associated with these pollutants, which are discussed in Section 3.1.1.

The final rule modeling results demonstrate significant reductions in selenium and cadmium concentrations in Lick Creek, which will eliminate exceedances of the non-cancer health effects reference dose for all cohorts for these pollutants. While the modeling results continue to show thallium water concentrations that would translate to exceedances of the non-cancer health effects reference doses for all cohorts, the final rule will reduce the magnitude of the human health impacts and reduce thallium loading contributions from Petersburg Generating Station.

Interpretation of Lick Creek and White River Results

Case study modeling results for Lick Creek indicate that there are severe water quality, wildlife, and human health impacts in Lick Creek. Case study modeling of Lick Creek reveals more exceedances of water quality and human health benchmarks than the IRW model; however, the IRW model predicts more impacts to benthic organisms than the case study modeling results. The exceedances identified in Lick Creek are based solely on discharges of the evaluated wastestreams from Petersburg Generating Station because EPA did not identify any STORET monitoring data or point sources suggesting any other sources were contributing pollutant discharges on this small tributary.

The pollutant loadings discharged by Petersburg Generating Station contribute to the overall concentrations in the White River, along with other upstream sources. Case study modeling indicates that some of the water quality impacts identified in Lick Creek for arsenic, cadmium, selenium, thallium, and lead can occur in the White River, far downstream of where Lick Creek flows into it. For thallium, these downstream impacts are solely caused by the discharges of the evaluated wastestreams from the plant because EPA did not identify any other sources of thallium within the modeling period. For arsenic and lead, the projected exceedances are driven by the background concentrations flowing into the White River modeling area. Pollutant loadings from Petersburg Generating Station may be further impairing the degraded waterway for arsenic and lead. For lead and zinc, the average water column concentrations are

highest downstream in the White River, indicating that pollutants with high partition coefficients may pose a greater threat to humans and aquatic life in the White River than in Lick Creek. The case study modeling results suggest that while high concentrations of toxic pollutants may dilute once Lick Creek empties into the White River, there are still impacts downstream that are not captured by the IRW model.

Under the final rule, case study modeling of Lick Creek and the White River indicate that both these waterbodies will exhibit fewer exceedances of water quality benchmarks. Additionally, Lick Creek will no longer pose reproductive risks to higher trophic-level wildlife and will pose less risk to humans consuming fish for cancer and non-cancer impacts. Case study modeling predicts more water quality improvements in the modeling area than the IRW model. This is due in part to the greater water quality impacts under baseline conditions, which created additional opportunities for modeled improvements, and in part to the identified improvements in downstream reaches of the White River that were not evaluated as part of the IRW model. Case study modeling predict fewer human health improvements than the IRW model. The average pollutant concentrations throughout the entire modeling area reduce promptly after compliance with the final rule.

8.2.4 Ohio River Case Study

The 948-mile Ohio River flows westward from Pittsburgh, Pennsylvania, to Cairo, Illinois, where it meets the Mississippi River. According to 2013 TRI reporting, 23 million pounds of chemicals were discharged into the Ohio River, more than any other surface water in the TRI database [U.S. EPA, 2013a]. EPA identified that 24 steam electric power plants evaluated in the EA discharge one or more of the evaluated wastestreams to the Ohio River or to tributaries that flow into the Ohio River in under five miles. FirstEnergy Corp. (FirstEnergy) owns and operates several of the coal-fired power plants that discharge to the Ohio River.

The Bruce Mansfield plant (Plant ID 2269) is FirstEnergy's largest coal-fired power plant by nameplate capacity. The plant is located in Shippingport, Pennsylvania, along the Ohio River, approximately 25 miles northwest of Pittsburgh. This plant operates three stand-alone steam turbines, each with a nameplate capacity of 914 MW. These three generating units have a total capacity of 2,741 MW and reported producing approximately 19,000,000 MWh of electricity in 2009 [ERG, 2015j]. The Bruce Mansfield plant discharges FGD wastewater and bottom ash transport water directly to the Ohio River from the Little Blue Run surface impoundment, which straddles the border of Pennsylvania and West Virginia. Table 8-5 contains general information about the three coal-fired generating units at the Bruce Mansfield plant.

Located along the Ohio River in Stratton, Ohio, FirstEnergy's W.H. Sammis plant (Plant ID 103) is the largest coal-fired power plant in Ohio. W.H. Sammis Plant's seven stand-alone steam turbine generating units have a total nameplate capacity of 2,460 MW. Based on data EPA obtained in responses to the Steam Electric Survey, the W.H. Sammis plant reported generating more than 9,500,000 MWh of energy with these seven coal-fired generating units in 2009. The W.H. Sammis plant discharges three of the evaluated wastestreams (FGD wastewater, bottom ash transport water, and combustion residual leachate) directly to the Ohio River. Table 8-6 contains general information about each of the seven steam electric generating units at the W.H. Sammis plant.

Table 8-5. Summary of Bruce Mansfield Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1	Bituminous coal and No. 2 fuel oil	914	Wet scrubber [a]	Wet handled to impoundment	Wet system (1975)
2	Bituminous coal and No. 2 fuel oil	914	Wet scrubber [a]	Wet handled to impoundment	Wet system (1977)
3	Bituminous coal and No. 2 fuel oil	914	Dry conveyed	Wet handled to impoundment	Wet system (1980)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

a – EPA does not consider the ash collected by venturi-type wet scrubbers as fly ash, and therefore, the water generated by these systems is not considered fly ash transport water.

Table 8-6. Summary of W.H. Sammis Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1	Bituminous coal, subbituminous coal, and No. 2 fuel oil	190	Dry conveyed	Wet handled to impoundment	Wet system (2010)
2	Bituminous coal, subbituminous coal, and No. 2 fuel oil	190	Dry conveyed	Wet handled to impoundment	Wet system (2010)
3	Bituminous coal, subbituminous coal, and No. 2 fuel oil	190	Dry conveyed	Wet handled to impoundment	Wet system (2010)
4	Bituminous coal, subbituminous coal, and No. 2 fuel oil	190	Dry conveyed	Wet handled to impoundment	Wet system (2010)
5	Bituminous coal, subbituminous coal, and No. 2 fuel oil	334	Dry conveyed	Wet handled to impoundment	Wet system (2010)
6	Bituminous coal, subbituminous coal, and No. 2 fuel oil	680	Dry conveyed	Wet handled to impoundment	Wet system (2010)
7	Bituminous coal, subbituminous coal, and No. 2 fuel oil	680	Dry conveyed	Wet handled to impoundment	Wet system (2010)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

In estimating the historical pollutant loadings associated with W.H. Sammis' three FGD systems, EPA incorporated the pollutant loadings for FGD wastewater as the systems were installed, between March and May 2010. EPA did not model any FGD wastewater pollutant loadings in the model prior to the installation of W.H. Sammis plant's first FGD system.

Modeling Area

The Ohio River WASP model encompasses a 49-mile-long reach of the Ohio River, 37 miles of which is downstream of one or both of the two modeled steam electric power plant immediate receiving waters. Located furthest upstream, the Bruce Mansfield plant discharges approximately 12 miles downstream of the start of the modeling area. The immediate receiving water that the Bruce Mansfield plant discharges to is approximately 3.3 miles long, as defined in the WASP model. W.H. Sammis plant discharges 13 miles downstream of the Bruce Mansfield plant's immediate receiving water. The immediate receiving water that W.H. Sammis plant discharges to is approximately 3.4 miles long, as defined in the WASP model. The modeling area ends just upstream of the discharges from another steam electric power plant, the Cardinal plant (Plant ID 3265). EPA did not model the pollutant loadings from the Cardinal plant because of CBI claims on one or more of the evaluated wastestream flow rates. Figure 8-5 illustrates the location and extent of the Ohio River WASP model.

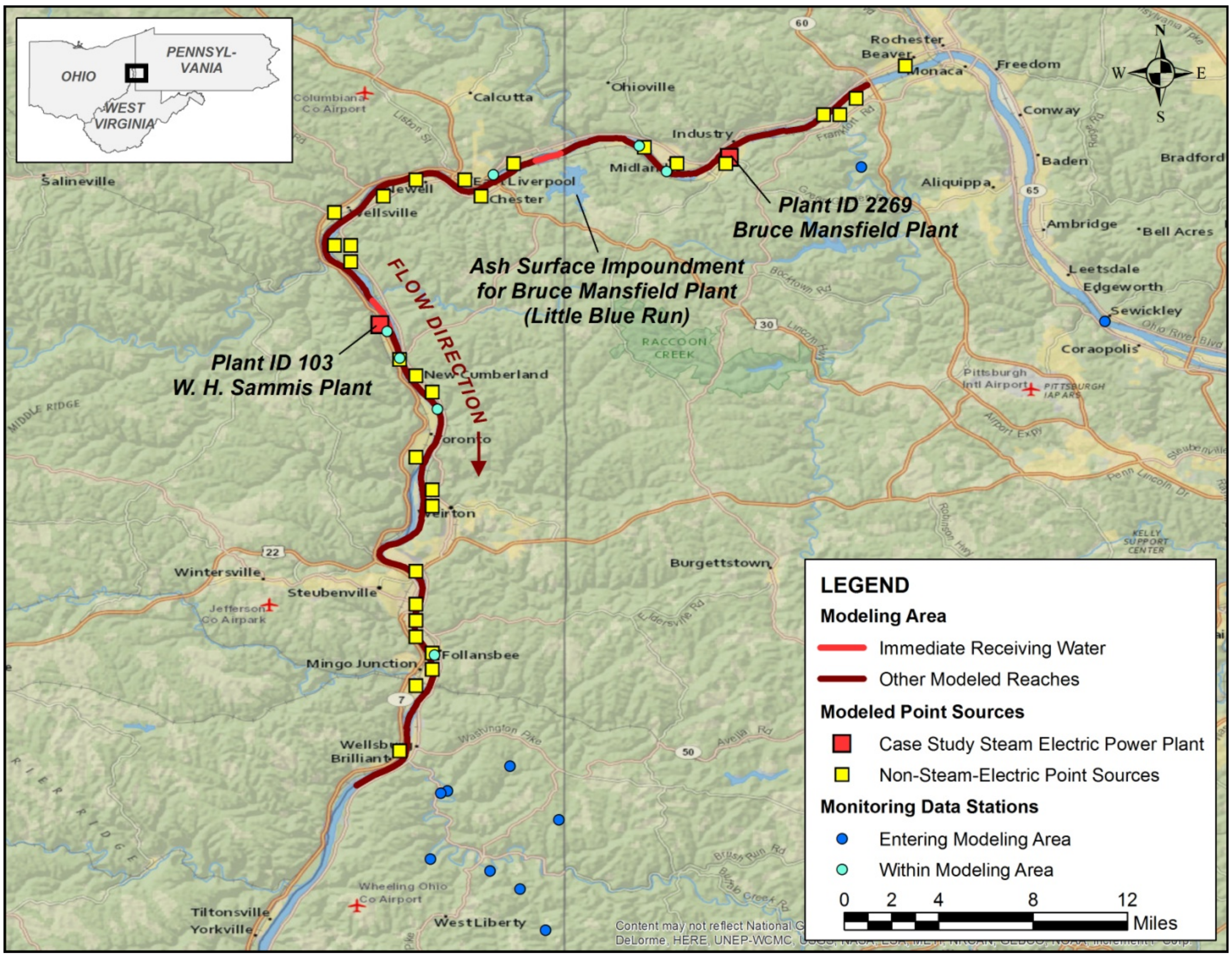


Figure 8-5. Ohio River WASP Modeling Area

Identified Point Sources and Background Concentrations

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Ohio River WASP model to represent pollutant contributions from background and non-steam-electric point sources, and for use in calibrating the model results.

- **Upstream pollutant contributions**. EPA identified many upstream non-steam-electric point sources whose pollutant loadings could influence the model results. EPA identified STORET data from one monitoring station on the Ohio River (approximately 28 river-miles upstream of Bruce Mansfield plant's immediate receiving water). EPA incorporated the monitoring data (which encompass five of the modeled pollutants) to represent the pollutant contributions flowing into the modeling area. EPA identified additional STORET monitoring data from one station on a tributary to the Ohio River; EPA incorporated these data to represent pollutant contributions flowing in from that tributary. EPA also incorporated the pollutant loadings, based on DMR and TRI data, from seven non-steam-electric point sources upstream of the Bruce Mansfield plant's immediate receiving water to account for the pollutant contributions not captured by the STORET monitoring data.
- **Downstream pollutant contributions**. EPA incorporated STORET data from eight monitoring stations to represent TSS concentrations flowing into the modeling area downstream of both steam electric power plant immediate receiving waters (*i.e.*, tributaries flowing into the Ohio River). These monitoring stations all represent one tributary that flows into the Ohio River near the downstream end of the modeling area. EPA identified 29 non-steam-electric point sources whose pollutant loadings could influence the model results downstream of the Bruce Mansfield plant immediate receiving water and incorporated these pollutant loadings into the Ohio River WASP model.
- **Monitoring data within the modeling area.** EPA compiled STORET data from seven monitoring stations located within the modeling area and used these data to calibrate the WASP model.

The contributions of copper, lead, nickel, and zinc from upstream sources are significantly greater than the pollutant loadings from the Bruce Mansfield and W.H. Sammis plants.

The Ohio River case study model did not account for the documented surface water and ground water impacts from Bruce Mansfield or Little Blue Run that are listed in Appendix A. In 1993, a catastrophic release of steam electric power plant wastewater compromised the quality of ground water and surface water around the Bruce Mansfield plant and Little Blue Run impoundment. Due to the lack of pollutant loadings data, surface water quality impacts resulting from this event are not reflected in this model; therefore, the case study modeling could underrepresent the actual baseline impacts of the Bruce Mansfield plant on the Ohio River.

Modeling Period

The modeling period starts in 1982 (year of the last revision to the steam electric ELGs) and extends through 2036, covering a period of 55 years. Based on their NPDES permitting cycles, EPA assumes that the Bruce Mansfield and W.H. Sammis plants will achieve the limitations under the final rule by 2020 and 2021, respectively. EPA focused the assessment of the improvements under the final rule on the period after the 2021 assumed compliance date.

Modeling Results – Water Quality

Under baseline conditions, the modeled pollutant concentrations in the modeled portion of the Ohio River exceed a human health NRWQC water quality benchmark for one modeled pollutant (arsenic), indicating that arsenic loadings from the two steam electric power plants may contribute to a quantifiable reduction in water quality in the modeled portions of the Ohio River. Arsenic concentrations in 33 miles of the modeling area downstream of the Bruce Mansfield plant exceed the human health water quality benchmark for consumption of water and organisms (0.018 µg/L). These exceedances begin several miles downstream of the Bruce Mansfield plant due to the pollutant loadings from a non-steam-electric point source. This area of exceedances continues downstream of the W.H. Sammis plant for 24 miles (including the W.H. Sammis plant's immediate receiving water) and exceeds the arsenic benchmark during 30 percent of the modeling period. In some portions of the modeling area, the frequency of these exceedances increases due to arsenic contributions from other non-steam-electric point sources. These case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms inhabiting these modeled portions of the Ohio River may be more at risk of the negative effects associated with oral exposure to arsenic (see Section 3.1.1). On rare occasions (less than 1 percent of the modeling period), the modeled pollutant concentrations exceed the MCL drinking water benchmark for one pollutant (lead), indicating that lead loadings from the two steam electric power plants may contribute to a quantifiable reduction in water quality in the modeled portions of the Ohio River. These rare lead exceedances occur in 15 miles of the modeling area downstream of the Bruce Mansfield plant, of which 13 miles are also downstream of the W.H. Sammis plant (including the immediate receiving water).

Modeling results do not indicate any exceedances of human health NRWQC criteria for the other modeled pollutants (cadmium, copper, nickel, selenium, thallium, and zinc) and do not indicate any exceedances of aquatic life NRWQC or MCL criteria for any of the eight modeled pollutants. Appendix G of this report includes figures that illustrate the water column pollutant concentration output for the immediate receiving water for arsenic and lead. These figures also present the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling results show significantly decreased concentrations of four of the modeled pollutants (arsenic, cadmium, selenium, and thallium) in the modeled portion of the Ohio River, which will improve water quality. These pollutant removals result in less frequent exceedances of human health NRWQC benchmarks compared to those estimated in the baseline modeling. Arsenic exceedances of human health water quality benchmarks for consumption of water and organisms reduce in frequency from 30 percent to 6 percent of the modeling period in the W.H. Sammis plant's immediate receiving water. Additionally, the exceedances of these

benchmarks reduce in frequency in all remaining sections of the downstream modeling area following compliance with the final rule. Despite the continued exceedances of the arsenic human health criteria and the lead MCL benchmark, reducing the pollutant concentrations in the water column may decrease the risk to humans.

Modeling Results – Wildlife

Based on the average pollutant concentrations in the water column under baseline conditions, the modeled portion of the Ohio River does not exceed the concentrations that would translate to NEHC exceedances and does not pose a risk to minks and eagles that consume contaminated fish. Despite the modeling not being able to quantify any improvements to minks and eagles under the final rule, the pollutant loading removals will decrease bioaccumulation of toxic pollutants in the terrestrial food chains.

Modeling results do not indicate that there are any pollutant concentrations in the upper benthic sediment that exceed CSCL benchmarks for any of the eight modeled pollutants; therefore, the modeled portion of the Ohio River does not pose a threat to benthic organisms in contact with contaminated sediment. Despite the modeling not being able to quantify any improvements to benthic organisms under the final rule, the pollutant loading removals will decrease the concentrations of toxic pollutants in benthic sediment and decrease the exposure of organisms to these pollutants.

Modeling Results – Human Health

Under baseline conditions, the average concentration of arsenic in fish over the modeling period does not result in an estimated cancer risk greater than 1-in-a-million for any of the national-scale cohorts.

Based on the average pollutant concentrations in the water column under baseline conditions, thallium poses the greatest threat to cause non-cancer health effects in humans from fish consumption. Average thallium concentrations in the W.H. Sammis plant's immediate receiving water are greater than the concentration that would translate to exceedances of the reference doses for the child (younger than 11 years old) subsistence fisher cohorts. Average thallium concentrations in 24 miles of the modeling area downstream of the W.H. Sammis plant are high enough to trigger exceedances of the reference dose for at least one subsistence cohort. Therefore, humans who consume fish inhabiting these waters may be at greater risk for developing the negative health effects associated with thallium, which are discussed in Section 3.1.1.

The final rule modeling results demonstrate significant reductions in thallium, eliminating thallium exceedances of the non-cancer health effects reference dose throughout the entire modeling area.

Interpretation of Ohio River Results

Case study modeling results for the Ohio River indicate greater water quality and human health impacts under baseline conditions than predicted by the IRW model. The impacts identified in the Ohio River by case study modeling are more extensive than the IRW model

because EPA has accounted for pollutant contributions from upstream on the Ohio River, other waterways flowing into the Ohio River, and non-steam electric point sources. Modeled alone, the Bruce Mansfield plant and W.H. Sammis plant would not cause any quantifiable impacts over the modeling period; however the modeled potion of the Ohio River is heavily industrialized. EPA identified 34 non-steam electric point sources that discharge one or more of the modeled pollutants and report to DMR or TRI. The pollutant contributions from the Bruce Mansfield plant, W.H. Sammis plant, and these other non-steam electric point sources modeled accumulate in the waterbody, increasing the overall water column concentrations to a degree that adversely affects water quality and human health. EPA identified exceedances of human health benchmarks that indicate that consuming water and/or organisms from the modeled portion of the Ohio River, including the W.H. Sammis plant's immediate receiving water and areas downstream, can cause health problems related to arsenic, lead, or thallium. The Ohio River case study model results exemplify that, by not accounting for non-steam-electric point sources discharging to the same waterbodies as steam electric power plants, the IRW model may be under-representing the total number of receiving waters with impacts that are caused, in part, by pollutant contributions from the steam electric power generating industry. The case modeling results also suggest that the discharges of the evaluated wastestreams from Bruce Mansfield plant and W.H. Sammis plant may be further impairing the degraded waterway.

Case study modeling of the Ohio River indicates that, under the final rule, the Ohio River will exhibit less frequent exceedances of water quality benchmarks and will eliminate risk to humans consuming fish that inhabit these waters. The human health non-cancer impacts and improvements under the final rule are solely caused by the reduction in steam electric plant pollutant loadings (there are no other input sources of thallium in the Ohio River WASP model).The improvements identified by the case study model are more extensive than what was projected by the IRW model for either of Bruce Mansfield plant or W.H. Sammis plant. This is due in part to the greater water quality and human health impacts under baseline conditions, which created additional opportunities for modeled improvements, and in part to the identified improvements in downstream reaches of the Ohio River that were not evaluated as part of the IRW model. The average pollutant concentrations throughout the entire modeling area reduce within a year after compliance with the final rule.

8.2.5 Mississippi River Case Study

The Mississippi River watershed is the largest in North America, covering about 40 percent of the lower 48 states. The 190-mile stretch of the Mississippi River between the confluence with the Missouri River at St. Louis, Missouri, and the confluence with the Ohio River at Cairo, Illinois, is known as the Middle Mississippi River. South of St. Louis along this stretch of the river, Ameren Corporation operates the Rush Island steam electric power plant (Plant ID 5038) on the west bank of the Mississippi River. The Rush Island plant operates two stand-alone steam turbine units with a nameplate capacity of 670 MW each. Together, these two coal-fired generating units have a capacity of 1,340 MW and reported producing over 8,500,000 MWh of electricity in 2009 in the Steam Electric Survey. The Rush Island plant discharges fly ash and bottom ash transport water directly to the Mississippi River. Table 8-7 contains general information on the two coal-fired units at the Rush Island plant.

Table 8-7. Summary of Rush Island Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1	Subbituminous coal and No. 2 fuel oil	670	Dry conveyance & wet handled to impoundment	Wet handled to impoundment	No FGD system
2	Subbituminous coal and No. 2 fuel oil	670	Dry conveyance & wet handled to impoundment	Wet handled to impoundment	No FGD system

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

Modeling Area

The Mississippi River WASP model encompasses a 46-mile-long reach of the Mississippi River, 23 miles of which is downstream of the Rush Island plant immediate receiving water. The model has two start boundaries that are on the Meramec River and Mississippi River shortly upstream of their confluence. The immediate receiving water that the Rush Island plant discharges to is approximately 1.5 miles long, as defined in the WASP model. This model ends at the confluence of the Mississippi River and Kaskaskia River. Figure 8-6 illustrates the location and extent of the Mississippi River WASP model.

Identified Point Sources and Background Concentrations

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Mississippi River WASP model to represent pollutant contributions from background and non-steam-electric point sources, and for use in calibrating the model results.

- **Upstream pollutant contributions from non-steam-electric point sources**. EPA identified several upstream non-steam-electric point sources whose loadings could influence the model results. EPA therefore extended the modeling area upstream to model these point sources and incorporate upstream monitoring data. EPA identified STORET data from four monitoring stations on the Mississippi River prior to the confluence with the Meramec River (approximately 24 river-miles upstream of Rush Island's immediate receiving water). EPA incorporated the monitoring data (which encompass all of the modeled pollutants except for thallium) to represent the pollutant contributions in the Mississippi River prior to where it converges with the Meramec River. EPA assumed that the monitoring data adequately reflect the pollutant contributions from upstream of this confluence. EPA incorporated the pollutant loadings from three non-steam-electric point sources downstream of the convergence to account for the pollutant contributions not captured by the STORET monitoring data.
- **Upstream pollutant contributions from steam electric sources**. EPA identified one steam electric power plant, Ameren's Meramec plant (Plant ID 1435), whose loadings could influence the model results at the Rush Island immediate receiving water and other downstream locations. EPA incorporated the loadings from the Meramec plant into the extended Mississippi River model, as discussed further below.

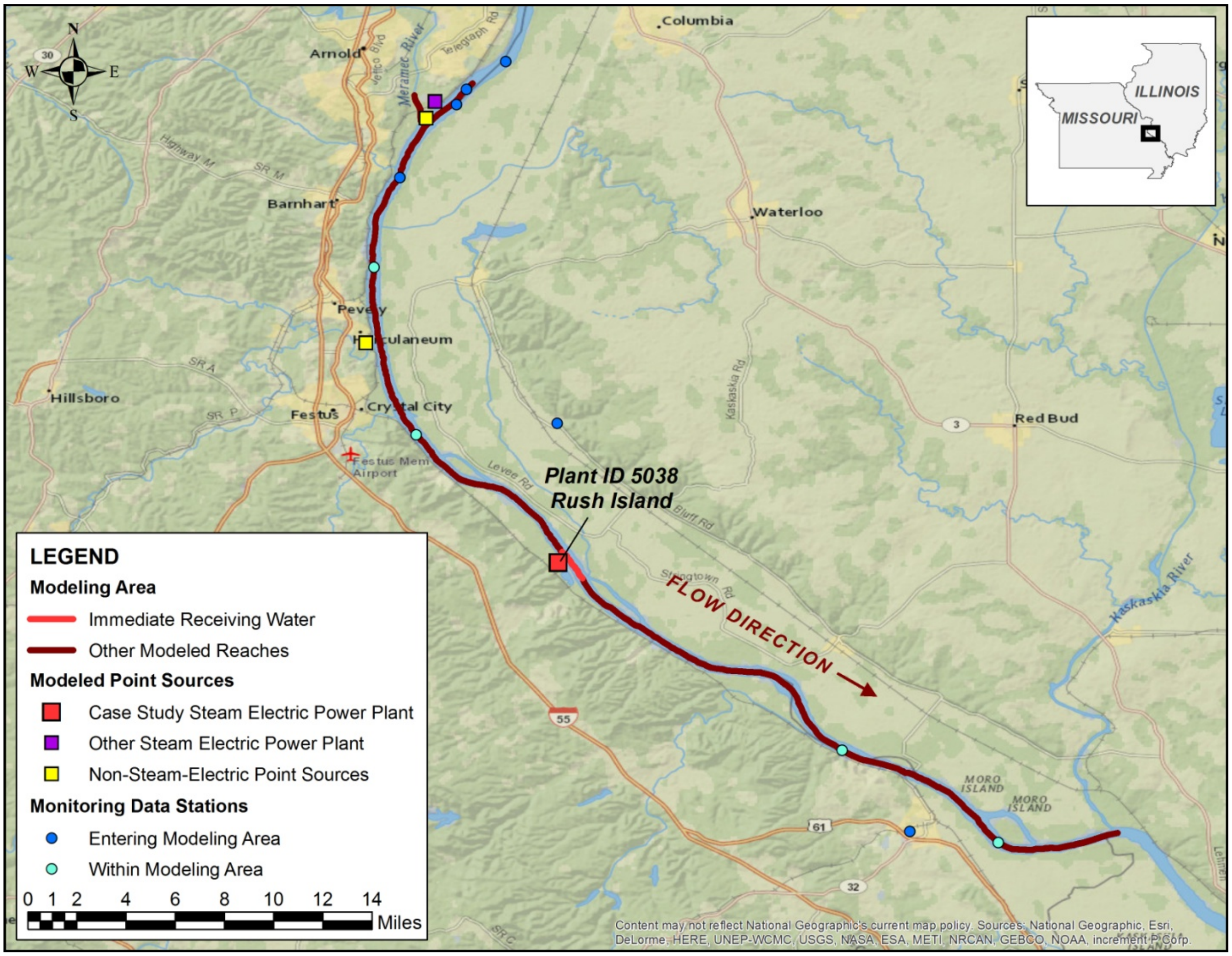


Figure 8-6. Mississippi River WASP Modeling Area

- **Downstream pollutant contributions**. EPA incorporated STORET data from two monitoring stations to represent pollutant concentrations flowing into the modeling area downstream of the Rush Island immediate receiving water (*i.e.*, tributaries flowing into the Mississippi River). EPA did not identify any non-steam-electric point sources whose pollutant loadings would significantly influence the model results in the downstream modeling area.
- **Monitoring data within the modeling area**. EPA compiled STORET data from four monitoring stations located within the modeling area and used these data to calibrate the WASP model.

The Meramec plant discharges approximately 24 river miles upstream of the Rush Island plant's immediate receiving water. EPA did not identify STORET monitoring data between the two plants to represent the pollutant concentrations from the Meramec plant; therefore, EPA incorporated the pollutant loadings from the Meramec plant (as calculated for this rulemaking) into the Mississippi River model. The Meramec plant operates four coal-fired generating units with a total nameplate capacity of 923 MW. All pollutant loadings from the evaluated wastestreams are from bottom ash transport water. EPA assumed that the Meramec plant will

comply with the standards of the final rule by 2019. EPA did not evaluate the water quality, wildlife, or human health impacts associated with discharges from the Meramec plant because this plant did not meet the case study location selection criteria described in Section 8.1.1. EPA incorporated the loadings from Meramec plant solely to account for the upstream pollutant contributions flowing into the Rush Island plant's immediate receiving water from upstream, under baseline conditions and the final rule.

The contributions of arsenic, cadmium, copper, lead, nickel, and zinc from upstream sources are significantly greater than the pollutant loadings from the Rush Island plant.

Modeling Period

The modeling period starts in 1982 (year of the last revision to the steam electric ELGs) and extends through 2036, covering a period of 55 years. Based on their NPDES permitting cycles, EPA assumes that the Meramec and Rush Island plants will achieve the limitations under the final rule by 2019 and 2023, respectively. For the Rush Island plant's immediate receiving water and downstream reaches, EPA focused the assessment of the baseline impacts and improvements under the final rule on the period after the 2023 assumed compliance date.

Modeling Results – Water Quality

Under baseline conditions, the modeled pollutant concentrations in the Rush Island plant's immediate receiving water and downstream reaches exceed human health NRWQC water quality benchmarks for one modeled pollutant (arsenic), indicating that loadings from Rush Island may contribute to a quantifiable reduction in water quality in the modeled portions of the Mississippi River. Arsenic concentrations in the Rush Island plant's immediate receiving water exceed the human health water quality benchmark for consumption of water and organisms (0.018 µg/L) and the human health water quality benchmark for consumption organisms (0.14 µg/L) for the entire modeling period. These exceedances continue downstream, at the same frequency, throughout the entire 23-mile-long modeling area downstream of the plant. The case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms that inhabit these modeled portions of the Mississippi River may be more at risk of the negative effects associated with oral exposure to arsenic (see Section 3.1.1).

Modeling results do not indicate any exceedances of human health NRWQC benchmarks for the other modeled pollutants (cadmium, copper, nickel, lead, selenium, thallium, and zinc). In addition, modeling results do not indicate any exceedances of aquatic life NRWQC or MCL criteria for any of the eight modeled pollutants. Appendix G of this report includes figures that illustrate the water column pollutant concentration output for the immediate receiving water for arsenic. This figure also presents the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling continues to show human health NRWQC benchmark exceedances for arsenic within the Mississippi River due to additional arsenic contributions from other sources (*i.e.*, Mississippi River background concentrations and non-steam electric point sources). However, under the final rule, both the Meramec and Rush Island plants will no longer

discharge any of the evaluated wastestreams and will therefore no longer contribute to the arsenic or lead impairment of the Mississippi River.

Modeling Results – Wildlife

Based on the average pollutant concentrations in the water column under baseline conditions, the modeled portion of the Mississippi River does not exceed the concentrations that would translate to NEHC exceedances and does not pose a risk to minks and eagles that consume contaminated fish. Despite the modeling not being able to quantify any improvements to minks and eagles under the final rule, the pollutant loading removals will decrease bioaccumulation of toxic pollutants in the terrestrial food chains.

Modeling results do not indicate that there are any pollutant concentrations in the upper benthic sediment that exceed CSCL benchmarks of for any of the eight modeled pollutants; therefore, the modeled portion of the Mississippi River does not pose a threat to benthic organisms in contact with contaminated sediment. Despite the modeling not being able to quantify any improvements to benthic organisms under the final rule, the pollutant loading removals will decrease the concentrations of toxic pollutants in benthic sediment and decrease the exposure of organisms to these pollutants.

Modeling Results – Human Health

EPA modeled the average pollutant concentrations in the water column and compared these to the concentrations that would trigger exceedances of either the non-cancer reference dose or the 1-in-a-million LECR. Under baseline conditions, the average water column concentration of arsenic throughout the modeling area downstream of the plant results in an estimated cancer risk greater than 1-in-a-million for adult subsistence fishers. Therefore, humans who consume arsenic-contaminated fish inhabiting the immediate receiving water may be at greater risks for development of cancer. Modeling results demonstrate no reduction in the cancer risk from inorganic arsenic under the final rule.

Under baseline conditions, the average pollutant concentrations over the modeling period does not pose the threat to cause non-cancer health effects for adult and children recreational and subsistence fishers (all national-scale cohorts evaluated).

Interpretation of Mississippi River Results

Case study modeling results for the Mississippi River indicate greater water quality and human health impacts under baseline conditions than predicted by the IRW model. By accounting for pollutant contributions from background and upstream sources, the case study model predicts higher pollutant concentrations under baseline conditions. For arsenic, the projected exceedances are driven by the pollutant contributions entering the Mississippi River upstream of the Rush Island plant. Alone, the steam electric discharges of the evaluated wastestreams would not cause any quantifiable impacts, which is consistent with the IRW model results; however, the pollutant loadings from the Rush Island plant may be further exacerbating the impairment of the degraded waterway.

The case study modeling of the Mississippi River indicates that, under the final rule, it will continue to exceed all of the water quality and human health benchmarks observed at baseline, with little to no reduction in frequency. Under the final rule, the Rush Island plant will no longer discharge any fly ash or bottom ash transport water. After compliance with the final rule, the modeled steam electric power plants will no longer contribute to the impairment of the Mississippi River and the overall magnitude of the pollutant concentrations in the aquatic system will decrease.

8.2.6 Lake Sinclair Case Study

Lake Sinclair is a reservoir located in central Georgia. The lake was created in 1953 when the waters of the Oconee River were dammed by Georgia Power, a subsidiary of Southern Company, to create a hydroelectric generating station. Georgia Power also owns and operates Plant Harllee Branch (Plant ID 5762), a steam electric power plant situated on the northern shore of Lake Sinclair. Based on 2009 data obtained in responses to the Steam Electric Survey, Plant Harllee Branch operated four coal-fired generating units with a total nameplate capacity of 1,750 MW and produced more than 6,800,000 MWh of electricity in 2009. As of April 16, 2015 (the date by which the plant would be required to comply with the U.S. EPA's Clean Power Plan [Clean Air Act Section 111(d)]), this plant has decertified and retired all four of its coal-fired generating units. Georgia Power cited several factors, including the cost to comply with existing and future environmental regulations, recent and future economic conditions, and lower natural gas prices, in the decision to close the plant. Plant Harllee Branch discharged FGD wastewater, fly ash transport water, and bottom ash transport water directly to Lake Sinclair. Table 8-8 contains general information on the four coal-fired units at Rush Island Plant.

Despite the retirement of all coal-fired generating units at this plant, EPA proceeded with case study modeling of Lake Sinclair to represent the potential impacts of steam electric discharges on lentic waterbodies (including the 26 lake, pond, and reservoir receiving waters evaluated in this EA) and the potential environmental improvements that could reasonably be expected under the final rule in other lentic waterbodies that receive discharges of the evaluated wastestreams. EPA did not include Plant Harllee Branch or Lake Sinclair in the other quantitative and qualitative analyses in this EA for the final rule (*e.g.*, the IRW model).

In estimating the historical pollutant loadings associated with Plant Harllee Branch, EPA incorporated the loadings only from generating unit IDs 3 and 4 because generating unit IDs 1 and 2 were flagged for retirement at the time of the proposed revised ELGs. EPA incorporated the loadings with the FGD wastewater as the systems were installed (starting in 2013). EPA did not model any FGD wastestream loadings in the historical model prior to the installation of Plant Harllee Branch's first FGD system.

Table 8-8. Summary of Plant Harllee Branch Operations

SE Unit	Fuel	Capacity (MW)	Fly Ash	Bottom Ash	FGD (Year Installed)
1 [a]	Bituminous coal and No. 2 fuel oil	299	Wet handled to impoundment	Wet handled to impoundment	Wet system (2014)
2 [a]	Bituminous coal and No. 2 fuel oil	359	Wet handled to impoundment	Wet handled to impoundment	Wet system (2014)
3	Bituminous coal and No. 2 fuel oil	544	Wet handled to impoundment	Wet handled to impoundment	Wet system (2013)
4	Bituminous coal and No. 2 fuel oil	544	Wet handled to impoundment	Wet handled to impoundment	Wet system (2013)

Source: ERG, 2015j.

Acronyms: FGD (Flue gas desulfurization); MW (Megawatt); SE (steam electric).

a – EPA did not model any pollutant loadings associated with these generating units.

Modeling Area

As discussed in Section 8.1.1, EPA relied upon the availability of existing models to perform case study modeling of lentic systems: an existing WASP model that divided the waterbody into segments and EFDC model that provided hydrodynamics and simulated the aquatic system in three dimensions. The EFDC model uses stretch or sigma vertical coordinates and Cartesian coordinates to represent the physical characteristics of Lake Sinclair.

The three-dimensional EFDC model, which provides the hydrodynamic foundation for the WASP model, divides the waterbody into 1,235 segments; each segment represents a unique location and stratum within Lake Sinclair. The model accounts for a total volume of approximately 340 million cubic meters. In contrast to the WASP models that EPA developed to model lotic systems, the Lake Sinclair model is not set up to quantify the pollutant concentrations in the benthic sediment; therefore, EPA was unable to assess whether pollutant accumulation in the sediment was occurring over prolonged discharge periods. Figure 8-7 illustrates the location and extent of the Lake Sinclair modeling area.

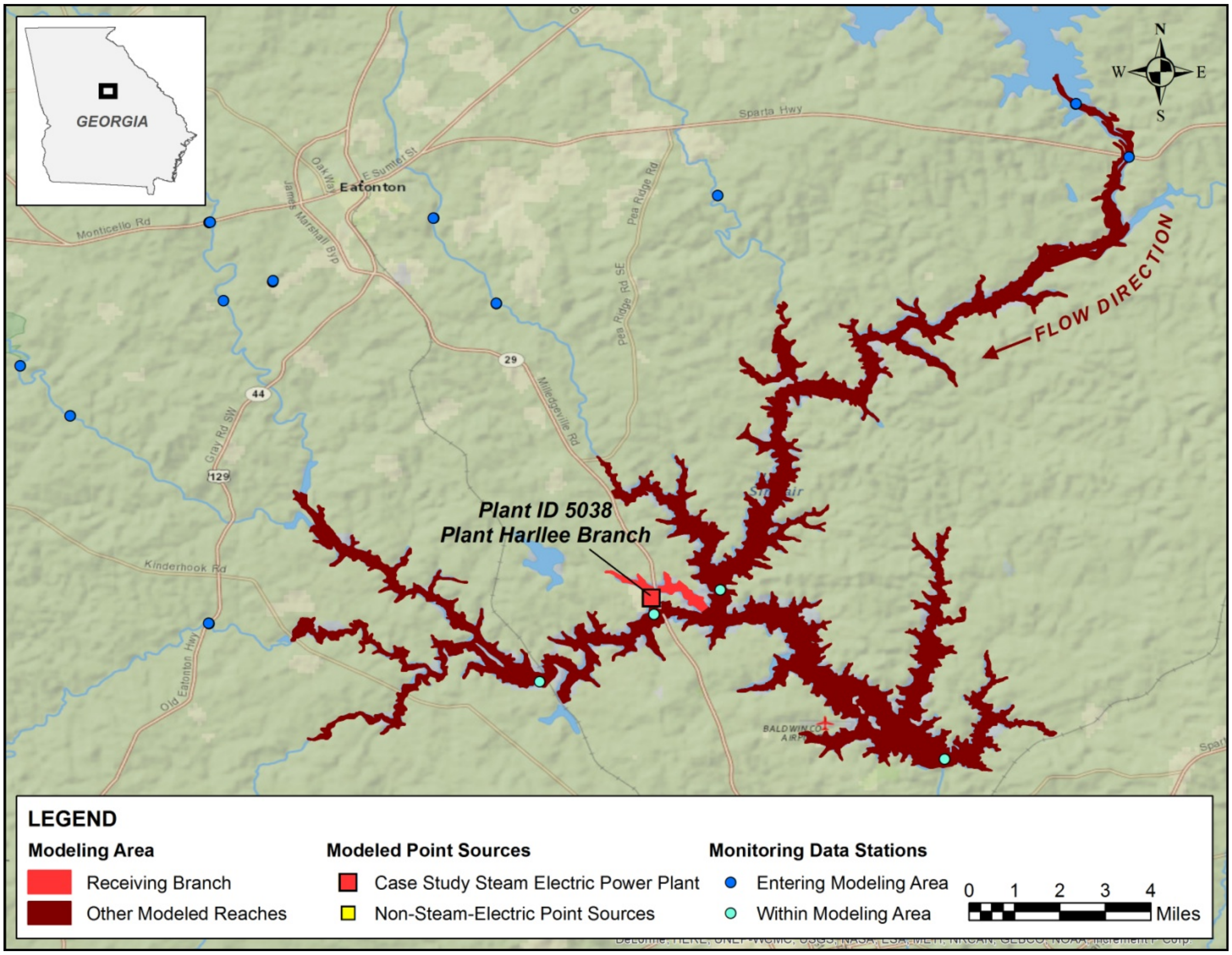


Figure 8-7. Lake Sinclair WASP and EDFC Modeling Area

Identified Point Sources and Background Concentrations

As discussed below, EPA reviewed available pollutant loadings (DMR and TRI) and monitoring data (STORET) for potential incorporation into the Lake Sinclair water quality model to represent pollutant contributions from background and non-steam-electric point sources, and for use in validating and calibrating the model results.

- **Upstream pollutant contributions.** EPA incorporated STORET data from three monitoring stations to represent TOC and TSS contributions from upstream of Lake Sinclair on the Oconee River. EPA did not identify sufficient STORET monitoring data to represent the pollutant contributions of the eight modeled pollutants or any upstream non-steam-electric point sources with loadings for the eight modeled pollutants. EPA therefore assumed pollutant concentrations of zero within the water column flowing into Lake Sinclair from the Oconee River.
- **Other pollutant contributions**. EPA incorporated STORET data from 15 monitoring stations to represent the modeled pollutants, TOC, and TSS concentrations flowing into Lake Sinclair from other streams. EPA did not identify any non-steam-electric

point sources whose pollutant loadings would significantly influence the model results.

- **Monitoring data within the modeling area.** EPA compiled STORET data from six monitoring stations located within the modeling area and used these data to calibrate the Lake Sinclair water quality model.

The pollutant concentrations entering the modeling area for arsenic, copper, lead, and thallium which EPA calculated using monitoring data, are much greater than the pollutant loadings from Lake Sinclair plant. The concentrations entering the modeling area for cadmium, nickel, and zinc also strongly influence the model outputs.

Modeling Period

As discussed earlier in this section, EPA adopted the preexisting Lake Sinclair EFDC model. The preexisting model was designed with seven years of hydrodynamic and flow input, limiting the length of the period EPA could model. Based on Plant Harllee Branch's NPDES permitting cycle, EPA assumed that the plant would have achieved the limitations under the final rule by 2019 if it continued to operate. The modeling period begins in February 2012 (approximately seven years before the assumed compliance date) and extends through November 2025 (approximately seven years after the assumed compliance date).

Modeling Results – Water Quality

EPA selected three portions of Lake Sinclair to evaluate the modeled pollutant concentrations: 1) the immediate receiving water (a 720,000-cubic-meter cell of the lake); 2) the average of all segments in the reach of the lake where Plant Harllee Branch discharges, including subsurface water segments (hereafter referred to as the "receiving branch"), and 3) the average of all segments included in the Lake Sinclair model, including subsurface water segments (hereafter referred to as the "entire modeling area").

Under baseline conditions, the modeled pollutant concentrations in Lake Sinclair, including the immediate receiving water and the receiving reach, exceed NRWQC water quality benchmarks for three modeled pollutants, indicating that pollutant loadings from Plant Harllee Branch may quantifiably reduce water quality in the modeled portions of Lake Sinclair. The reduced water quality is primarily attributed to arsenic, cadmium, and thallium.

The baseline modeled pollutant concentrations exceed human health criteria primarily for arsenic and thallium, as discussed below:

- Arsenic concentrations exceed the water quality benchmark for consumption of water and organisms (0.018 μg/L):
  - In the immediate receiving water for the entire modeling period.
  - In all modeled segments of the receiving branch for more than 99 percent of the modeling period.
  - In 97 percent of the entire modeling area for 10 percent or more of the modeling period.

- Arsenic concentrations also exceed the higher water quality benchmark for consumption of organisms (0.14 µg/L):
  - In five of the six modeled segments of the receiving branch for up to 19 percent of the modeling period.
  - In 54 percent of the entire modeling area for 10 percent or more of the modeling period.
- Thallium concentrations exceed the water quality benchmark for consumption of water and organisms (0.24 µg/L):
  - In three of the six modeled segments of the receiving branch for up to 6 percent of the modeling period.
  - In 14 percent of the entire modeling area for 10 percent or more of the modeling period.
- Thallium concentrations also exceed the higher water quality benchmark for consumption of organisms (0.47 µg/L):
  - In two of the six modeled segments of the receiving branch for less than 1 percent of the modeling period.
  - In 11 percent of the entire modeling area for 10 percent or more of the modeling period.

The case study modeling results indicate that, under baseline conditions, humans consuming water and/or organisms that inhabit these modeled portions of Lake Sinclair may be more at risk of the negative effects associated with oral exposure to arsenic and thallium (see Section 3.1.1).

Aquatic organisms may be at risk for exposure to cadmium under baseline conditions. Specifically, cadmium concentrations exceed the freshwater aquatic life criteria for chronic exposure (0.25 µg/L) in 4 percent of the entire modeling area for 10 percent or more of the modeling period. These case study modeling results indicate that, under baseline conditions, aquatic organisms inhabiting these modeled portions of Lake Sinclair could be at an elevated risk of the negative effects associated with oral exposure to cadmium (see Section 3.1.1).

Under baseline conditions, the modeled pollutant concentrations in Lake Sinclair occasionally exceed the MCL drinking water benchmarks for two of the modeled pollutants (arsenic and thallium), as discussed below:

- Arsenic concentrations exceed the MCL drinking water criteria (10 µg/L) in less than 1 percent of the segments for 10 percent or more of the modeling period.
- Thallium concentrations exceed the MCL drinking water criteria (2 µg/L) in 5 percent of the segments for 10 percent or more of the modeling period.

Modeling results do not indicate any exceedances of NRWQC or MCL criteria for the other modeled pollutants (copper, lead, nickel, selenium, and zinc). Appendix G of this report includes figures that illustrate the average water column pollutant concentration output for the

entire lake for arsenic, cadmium, and thallium. These figures also present the NRWQC and MCL benchmarks for the pollutant and the steady-state water column pollutant concentrations predicted by the IRW model.

The final rule modeling results show significantly decreased average concentrations of two of the modeled pollutants (nickel and selenium) in the modeled portion of Lake Sinclair. Case study modeling results for Lake Sinclair reveal the water quality improvements for arsenic under the final rule. Specifically, arsenic exceedances of the human health NRWQC benchmark for consumption of water and organisms reduce in frequency from the entire modeling period to 23 percent of the modeling period in the immediate receiving water and reduce from above 99 percent of the modeling period to as low as 23 percent of the modeling period in the receiving branch. Additionally, slightly less (2 percent of the modeling area) of Lake Sinclair will exceed this benchmark under the final rule. Arsenic exceedances of the higher human health NRWQC benchmark for consumption of organisms also reduce throughout the entire lake as 12 percent less of the modeling area exceed this benchmark for more than 10 percent of the modeling period.

While the modeling results demonstrate continuing arsenic, cadmium, and thallium exceedances of NRWQC and MCL benchmarks in the receiving reach and the entire modeling area, the pollutant loading contributions to the lake would be reduced under the final rule (if Plant Harllee Branch did not retire all generating units).

Modeling Results – Wildlife

For the analysis of wildlife impacts and improvements, EPA assumed that aquatic life travel freely throughout Lake Sinclair and do not confine themselves within particular segments of the lake. EPA calculated the average fish tissue concentrations of all segments within the Lake Sinclair model (*i.e.*, entire modeling area) for purposes of the wildlife assessment.

Based on the average pollutant concentrations in the water column under baseline conditions, the modeled portion of Lake Sinclair does not exceed the concentrations that would translate to NEHC exceedances and does not pose a risk to minks and eagles that consume contaminated fish. Despite the modeling not being able to quantify any improvements to minks and eagles under the final rule, the pollutant loading removals will decrease bioaccumulation of toxic pollutants in the terrestrial food chains (if Plant Harllee Branch did not retire all generating units).

The Lake Sinclair EFDC model is not set up to quantify the pollutant concentrations in the benthic sediment; therefore, EPA was unable to assess whether pollutant concentrations in the sediment exceeded CSCL benchmarks and pose a threat to benthic organisms.

Modeling Results – Human Health

For the analysis of human health impacts and improvements, EPA also assumed that fish travel freely throughout Lake Sinclair and do not confine themselves within particular segments of the lake. EPA calculated the average fish tissue concentrations of all segments within the Lake Sinclair model (*i.e.*, entire modeling area) for purposes of the human health assessment.

Under baseline conditions, the average water column concentration of arsenic in Lake Sinclair over the modeling period does not result in an estimated cancer risk greater than 1-in-a-million for any of the national-scale cohorts.

Based on the average pollutant concentrations in the water column under baseline conditions, thallium poses the greatest threat to cause non-cancer health effects in humans from fish consumption. Average thallium concentrations in the water column of the entire Lake Sinclair modeling area are greater than the concentrations that would translate to exceedance of the reference doses for adult and children recreational and subsistence fishers (all national-scale cohorts evaluated). Therefore, humans who consume thallium-contaminated fish inhabiting the modeled area of Lake Sinclair may be at greater risk for developing the negative health effects associated with these pollutants, which are discussed in Section 3.1.1.

While the modeling results continue to show thallium water concentrations that would translate to exceedances of the non-cancer health effects reference dose, the final rule will reduce thallium loading contributions from Plant Harllee Branch (if Plant Harllee Branch did not retire all generating units).

Interpretation of Lake Sinclair Results

The case study modeling results indicate that the water quality impacts are greater in the receiving branch (closest portion of the lake to the Plant Harllee Branch discharge) of Lake Sinclair compared to the rest of the lake. EPA identified that the receiving branch of Lake Sinclair also exhibited more quantifiable improvements (*i.e.*, reduced NRWQC and MCL benchmark exceedances) under the final rule than the average of all Lake Sinclair model segments. Despite the model not indicating any wildlife or human health impacts in Lake Sinclair, the reduction of pollutant loadings under the final rule would lessen the contribution of steam electric power plant discharges on the entire aquatic and terrestrial ecosystems.

8.3 COMPARISON OF CASE STUDY AND IRW MODELING RESULTS

In general, the case study modeling results from the six case study models support the overall conclusions of the IRW model.

Case study modeling of smaller receiving waters, such as Black Creek and Lick Creek, indicate that more severe water quality, wildlife, and human health impacts are occurring at baseline conditions than the IRW model predicted. Since flow rates in small receiving waters fluctuate significantly, the case study modeling demonstrates impacts that can occur during periods when the flow is lower than the annual average used in the IRW model. During the frequent periods of low flow in smaller rivers and streams, the case study modeling shows that pollutant concentrations quickly climb to levels that will negatively affect fish, wildlife, and humans. The Black Creek and Lick Creek case study model also suggests the potential for additional improvements under the final rule than the IRW model predicts. Case study modeling therefore indicates that small receiving waters with highly variable flow rates may benefit from the final rule more than the IRW model results suggest.

The case study modeling also demonstrates that the impacts from steam electric power plant discharges can propagate much further downstream than the immediate receiving water

used in the IRW modeling. In four of the six case study models, results illustrate that the pollutant loadings from steam electric power plant discharges of the evaluated wastestreams may contribute to water quality impacts up to 95 miles downstream of the plant discharge. These additional impacts, as well as additional improvements under the final rule, are not represented in the IRW modeling results.

Additionally, case study modeling of smaller water bodies revealed that downstream reaches may be heavily influenced by the sediment transport and exhibit much higher water column concentrations than the immediate receiving water. In the Black Creek, Etowah River, and White River results, “hot spots” with higher pollutant concentrations were observed and posed a greater risk to humans, aquatic life, and terrestrial food chains than reaches closer to the steam electric power plants.

EPA performed one case study model of a representative lentic receiving water to assess the potential impact on similar lakes or reservoirs that receive steam electric power plant discharges of the evaluated wastestreams. Case study modeling of Lake Sinclair showed that impacts are occurring in the lake, and these are more severe in the immediate area of the steam electric discharge as compared to the lake average. The water quality improvements demonstrated by the reduced exceedances of water quality benchmarks indicate that other lentic receiving waters may also exhibit similar improvements. Although the case study modeling of Lake Sinclair was unable to quantify the accumulation of pollutant concentrations in benthic sediment, lower concentrations of pollutants under the final rule should reduce pollutant long-term accumulation and consequential resuspension.

Each of the case study models demonstrated at least one exceedance of a water quality, wildlife, or human health benchmark for a modeled pollutant discharged from stream electric power plants. Under the final rule, the steam electric power plant(s) will contribute a reduced loading of the pollutant(s), thereby improving water quality in these receiving waters. As demonstrated by the Black Creek, Etowah River, Lick Creek and White River, Ohio River, and Lake Sinclair case study modeling results, pollutant removals will result in quantifiable improvements through reduced exceedances of environmental benchmarks.

SECTION 9
CONCLUSIONS

Based on evidence in the literature, damage cases, other documented impacts, and modeled receiving water pollutant concentrations, it is clear that current wastewater discharge practices at steam electric power plants are impacting the surrounding aquatic and terrestrial environments and pose a human health threat to nearby communities. EPA estimates that discharges from steam electric power plants contribute over one-third of the toxic-weighted pollutant loadings of the combined discharges of all industrial categories currently required to report discharges to U.S. waters. These discharges add large quantities of toxic bioaccumulative pollutants (*e.g.*, selenium, arsenic, and mercury) to the aquatic environment. Substantial evidence exists that pollutants from steam electric power plant wastewater discharges are transferring from the aquatic environment to terrestrial food webs; this indicates the potential for broader impacts to ecological systems by altering population diversity and community dynamics in the areas surrounding steam electric power plants. Ecosystem recovery from exposure to steam electric power plant wastewater discharges can be extremely slow and even short periods of exposure (*e.g.*, less than a year) can cause observable ecological impacts that last for years. The strong bioaccumulative properties and long residence times of pollutants in immediate receiving waters reinforce the threat of these wastes to the local environment, and many of the impacts may not be fully realized for years to come.

In addition, EPA's modeling demonstrates that pollutant loadings from discharges of the evaluated wastestreams are impacting areas beyond the immediate receiving waters and pose a threat to wildlife and human populations in thousands of river-miles downstream from steam electric power plants under current discharge practices. Furthermore, EPA predicts that the recently promulgated Clean Air Act requirements (*i.e.*, Clean Power Plan) and other state and local regulations may lead to additional air pollution controls (and resulting wastestreams) that will increase the pollutant loadings to surface waters in the future. These additional pollutant loadings above current baseline conditions will increase the number of immediate receiving waters exceeding water quality, wildlife, and human health benchmarks in the future.[65]

Steam electric power plants discharge wastewater into waterbodies used for recreation, and these discharges can present a potential threat to human health. Documented fish kills have resulted in states issuing fish advisories to protect the public from exposure to fish with elevated pollutant concentrations in recreational waters that receive these discharges. Combustion residual leachate from surface impoundments and landfills is known to impact off-site ground water and drinking water wells at concentrations above Maximum contaminant level (MCL) drinking water standards and pose a potential threat to human health.

[65] The analyses presented in this report incorporate some adjustments to current conditions in the industry. For example, these analyses account for publicly announced plans from the steam electric power generating industry to retire or modify steam electric generating units at specific power plants. These analyses also account for changes to the industry that are expected to occur as a result of the recent Coal Combustion Residuals (CCR) rulemaking by EPA's Office of Solid Waste and Emergency Response (OSWER). These analyses, however, do not reflect changes in the industry that may occur as a result of the proposed Clean Power Plan [Clean Air Act section 111(d)].

The final steam electric effluent limitations guidelines and standards (ELGs) will result in quantifiable improvements in ecological and human health by reducing immediate receiving water pollutant concentrations, on average, by 57 percent.[66] The final rule will result in the following environmental improvements as estimated by the national-scale immediate receiving water (IRW) model:

- A 51 to 67 percent reduction in the number of immediate receiving waters exceeding National Recommended Water Quality Criteria (NRWQC) for the protection of aquatic life.
- A 45 to 50 percent reduction in the number of immediate receiving waters exceeding an NRWQC for the protection of human health.
- A 63 to 64 percent reduction in the number of immediate receiving waters that support fish whose tissue pollutant concentrations exceed benchmarks for the protection of piscivorous wildlife (represented by minks and eagles).
- A 61 to 67 percent reduction in the number of immediate receiving waters where selenium contamination in the food web presents reproductive risks[67] to aquatic wildlife (represented by fish and mallards).
- A 56 to 75 percent reduction in the number of immediate receiving waters that support fish whose tissue pollutant concentrations pose a cancer risk to exposed populations.
- A 52 to 56 percent reduction in the number of immediate receiving waters that support fish whose tissue pollutant concentrations pose a risk of non-cancer health effects in exposed populations.

The results of the case study modeling for selected plants and receiving waters indicate that the environmental and human health impacts associated with steam electric power plant discharges, and the corresponding improvements under the final rule, could be even more extensive than those predicted by the IRW model. Case study modeling results demonstrate that the impacts from steam electric power plant discharges of the evaluated wastestreams can propagate much further downstream of the immediate receiving water. While the steam electric power plant discharges may not cause these impacts in isolation, case study modeling reveals that the discharges contribute to the further impairment of such waterways. Case study modeling results identified a larger increase in baseline impacts and improvements under the final rule in small receiving waters with variable flow than larger receiving waters. The analyses presented in the environmental assessment (EA) focus on quantifying the environmental improvements within rivers and lakes from post-compliance pollutant removals for metals, bioaccumulative pollutants, and nutrients.

[66] Reductions apply to the subset of pollutants evaluated in the environmental assessment (*i.e.*, arsenic, cadmium, chromium VI, copper, lead, mercury, nickel, selenium, thallium, and zinc).

[67] For this statistic, reproductive risk is indicated by a 50-percent (or higher) probability that adverse reproductive effects will occur in at least 10 percent of the exposed population of fish and mallards.

While extensive, the environmental improvements quantified above do not encompass the full range that will result from the final rule, such as the following improvements that are not quantified (or have only limited analysis) in this EA:

- Reducing the loadings of bioaccumulative pollutants to the broader ecosystem, decreasing long-term exposures and sublethal ecological effects.
- Reducing sublethal chronic effects of toxic pollutants on aquatic life not captured by the NRWQC.
- Reducing loadings of pollutants for which EPA did not perform water quality modeling in support of the EA (*e.g.*, boron, manganese, aluminum, vanadium, and iron).
- Mitigating impacts to aquatic and aquatic-dependent wildlife population diversity and community structures.[68]
- Reducing wildlife exposure to pollutants through direct contact with combustion residual impoundments and constructed wetlands built as treatment systems at steam electric power plants.
- Reducing water withdrawals from surface waters and aquifers, leading to greater availability of groundwater supplies for alternative uses and reducing fish impingement and entrainment mortality due to surface water intake structures.
- Reducing the potential of harmful algal blooms to form.

Data limitations prevented EPA from appropriately modeling the scale and complexity of the ecosystem processes potentially impacted by steam electric power plant wastewater and therefore did not fully quantify the improvements listed above. However, damage cases and other documented impacts in the literature reinforce that these impacts are common in the environments surrounding steam electric power plants and fully support the conclusion that pollutant removals will improve overall environmental and wildlife health.

As surface impoundments accumulate fly ash, bottom ash and flue gas desulfurization sludges, they can begin to fill up and lose their treatment capability.

Although the EA quantifies some impacts to wildlife that consume fish contaminated with pollutants from steam electric power plant wastewater, it does not capture the full range of exposure pathways through which bioaccumulative pollutants can enter the surrounding food web. Wildlife can encounter bioaccumulative pollutants from steam electric power plant wastewater discharges through direct exposure, drinking water, consuming

[68] EPA did evaluate impacts to aquatic and aquatic-dependent wildlife from selenium contamination as part of the ecological risk modeling. EPA did not quantify impacts that might occur due to other pollutant contamination.

contaminated vegetation, and consuming contaminated prey other than fish. Therefore, the quantified improvements underestimate the complete loadings of bioaccumulative pollutants that can impact wildlife in the ecosystem. EPA did quantify improvements to aquatic and aquatic-dependent wildlife due to reduced selenium exposure via the food web. The reduced selenium loadings under the final rule will significantly reduce the risk of negative reproductive effects to wildlife in waterbodies that receive discharges from steam electric power plants. In addition to the improvements resulting from reduced selenium loadings, EPA estimates that the post-compliance pollutant removals under the final rule will lower the total amount of bioaccumulative pollutants entering the food web in immediate receiving waters and downstream waters.

EPA estimates that pollutant removals will also decrease sublethal effects associated with many of the pollutants in steam electric power plant wastewater that may not be captured by comparisons with NRWQC for aquatic life. Well-documented studies suggest that organisms in aquatic environments near steam electric power plants exhibit chronic effects such as changes in metabolic rates, decreased growth rates, changes in morphology (*e.g.*, fin erosion, oral deformities), and changes in behavior (*e.g.*, decreased ability to swim, catch prey, or escape from predators) that can negatively affect long-term survival [Raimondo *et al*., 1998; Rowe *et al*., 1996, 2002]. However, these effects are not fully quantified in the EA due to data limitations, and therefore improvements to wildlife health and survival from the final rule may be underestimated. Reduced organism survival rates from chronic effects such as abnormalities can alter interspecies relationships (*e.g.*, declines in the abundance or quality of prey) and prolong ecosystem recovery. EPA was unable to quantify changes to aquatic and wildlife population diversity and community dynamics; however, population effects (*i.e.*, decline in number and type of organisms present) attributed to exposure to steam electric power plant wastewater are well documented in the literature [Lemly, 1985a; Garrett and Inman, 1984; Sorensen *et al*., 1982]. Changes in aquatic populations can alter the structure of aquatic communities and cause cascading effects within the food web that have long-term impacts to ecosystem dynamics. EPA estimates that post-compliance pollutant removals associated with the final rule will lower the stressors that can alter population and community dynamics and will improve the overall function of ecosystems surrounding steam electric power plants.

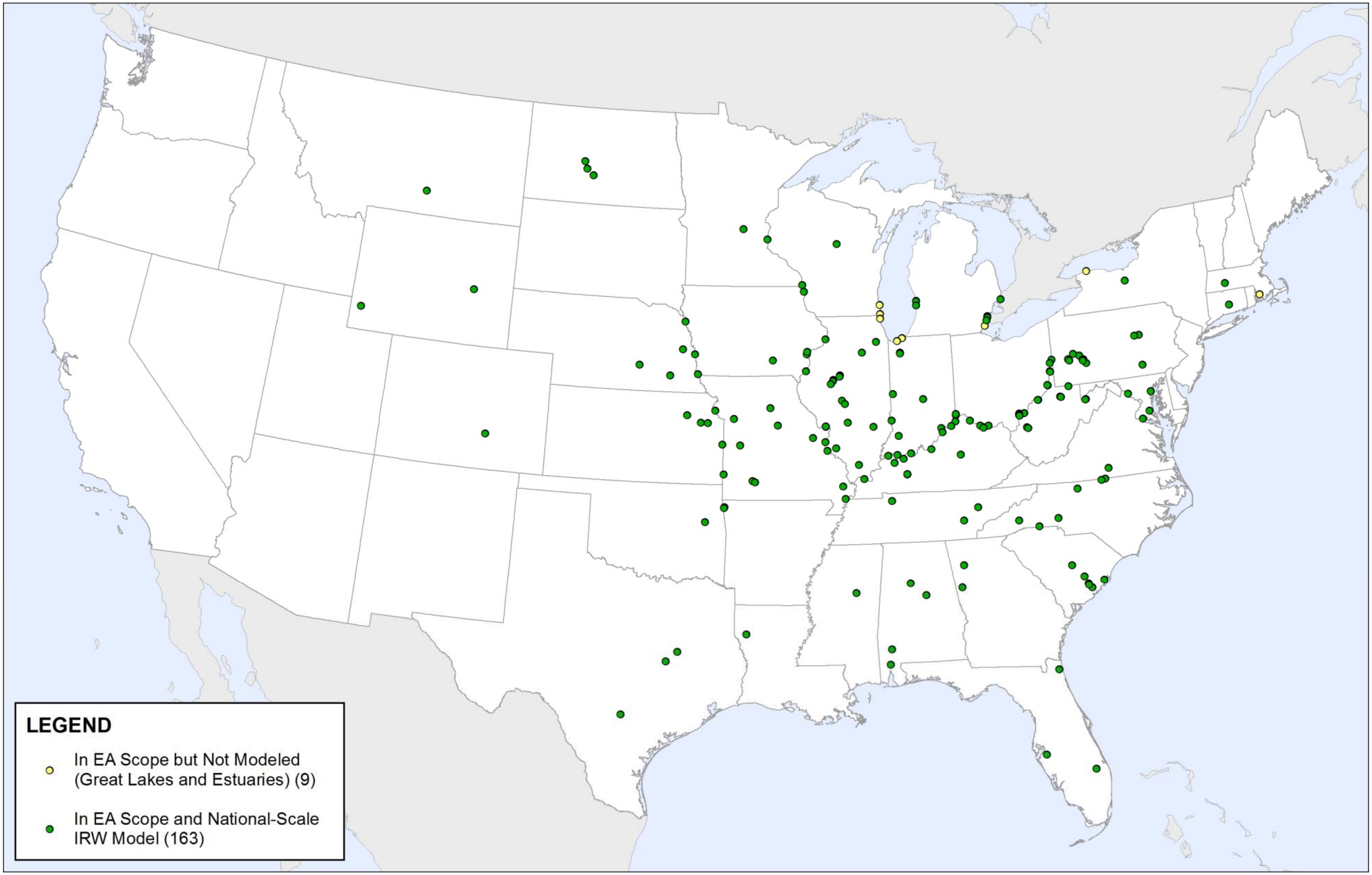


Figure I-1. Locations and Counts of Immediate Receiving Waters in EA Scope and Modeling Analyses

Table I-2. Receiving Water Types for Steam Electric Power Plants Evaluated in the EA

Receiving Water Type	Number (Percentage) of Immediate Receiving Waters in the Alternate Scenario Analysis [a]
River/Stream	144 (84%)
Lake/Pond/Reservoir	19 (11%)
Great Lakes	8 (5%)
Estuary	1 (<1%)
Total Receiving Waters	**172 (100%)**

Source: ERG, 2015d.

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The immediate receiving water (IRW) model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

EPA evaluated the annual baseline pollutant discharges of the evaluated wastestreams from steam electric power plants reflecting changes in the industry that may occur as a result of the CPP. Table I-3 presents the annual pollutant loadings in pounds and toxic-weighted pound equivalents (TWPE).[1,2] Table I-4 compares pollutant discharges, as TWPE, from the steam electric power generating industry to discharges from the other top ten discharging point source categories, as estimated by EPA for the 2010 Effluent Guidelines Planning Process [U.S. EPA, 2011d].

[1] To calculate the TWPE, EPA multiplies a mass loading of a pollutant in pounds per year (lb/yr) by a pollutant-specific weighting factor, called the toxic weighting factor (TWF), to derive a "toxic equivalent" loading (lb-equivalent/yr), or TWPE. TWFs account for differences in toxicity across pollutants and allow mass loadings of different pollutants to be compared on the basis of their toxic potential. EPA has developed TWFs for more than 1,000 pollutants based on aquatic life and human health toxicity data, as well as physical/chemical property data [U.S. EPA, 2012b].

[2] Prior to finalizing the rulemaking, EPA revised the datasets used to calculate pollutant loadings for bottom ash transport water and fly ash transport water. The final industry loadings calculated using these revised datasets are presented in the TDD. The total industry loadings presented in Appendix I reflect the revised datasets. However, EPA did not rerun the EA models and other analyses to reflect the final loadings dataset. EA analyses used previously calculated version of the steam electric power plant pollutant loadings that were derived following the same methodology. The EA pollutant loadings are included in DCN SE05622. Pollutant-specific loadings and removals presented in this report are based on the previously calculated version. Appendix J presents the results of a sensitivity analysis that evaluated the potential for these loadings revisions to affect the EA analyses.

Table I-3. Annual Baseline Pollutant Discharges from Steam Electric Power Plants (Evaluated Wastestreams)

Pollutant [a]	TWF [b]	Annual Discharge, pounds (lbs) [c]	Annual TWPE, pound-equivalent (lb-eq) [c]
Metals and Toxic Bioaccumulative Pollutants			
Manganese	0.103	6,320,000	649,000
Cadmium	22.8	10,900	249,000
Boron	0.00834	24,600,000	205,000
Mercury	110.0	1,180	129,000
Selenium	1.12	113,000	127,000
Thallium	2.85	43,900	125,000
Arsenic	3.47	22,200	77,100
Aluminum	0.0647	1,070,000	69,400
Lead	2.24	14,600	32,700
Vanadium	0.280	55,600	15,600
Copper	0.623	24,000	15,000
Iron	0.00560	2,110,000	11,800
Nickel	0.109	94,200	10,300
Zinc	0.0469	145,000	6,800
Chromium VI	0.517	119	61.4
Nutrients			
Total Nitrogen [d]	Not applicable	13,100,000	Not applicable
Total Phosphorus	Not applicable	154,000	Not applicable
Other			
Chlorides	2.435×10^{-5}	722,000,000	17,600
Total dissolved solids	Not applicable	3,290,000,000	Not applicable
Total Pollutants [e]		**1,700,000,000**	**2,140,000**

Sources: Abt, 2008; ERG, 2015a; ERG, 2015b; ERG, 2015f; U.S. EPA, 2012c.

Note: Numbers are rounded to three significant figures.

a – The list of pollutants included in this table is only a subset of pollutants included in the loadings analysis (see Section 10 of the Technical Development Document (TDD) (EPA-821-R-15-007).

b – TWFs for the following metals apply to all metal compounds: arsenic, chromium, copper, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc. EPA updated TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium for the steam electric ELGs pollutant loadings analysis.

c – These loadings reflect adjustments to current conditions in the industry to account for publicly announced plans from the steam electric power generating industry to retire or modify steam electric generating units at specific power plants; changes to the industry that are expected to occur as a result of the recent Coal Combustion Residuals (CCR) rulemaking by EPA's Office of Solid Waste and Emergency Response (OSWER); and changes to the industry that are expected to occur as a result of the CPP. Data source for pollutant specific loadings is DCN SE05622.

d – Total nitrogen is the sum of total Kjeldahl nitrogen and nitrate/nitrite as N.

e – The totals represent the pollutant loadings in discharges of the evaluated wastestreams – specifically, flue gas desulfurization (FGD) wastewater, fly ash transport wastewater, bottom ash transport wastewater, and combustion residual leachate (see Section 10 of the TDD). Loadings presented are based on the final loadings analysis presented in the TDD. The totals exclude loadings for pollutants not identified as pollutants of concern (POCs) and for biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), total dissolved solids (TDS), and total suspended solids (TSS).

Table I-4. Pollutant Loadings for the Final 2010 Effluent Guidelines Planning Process: Top 10 Point Source Categories

40 CFR Part	Point Source Category	Total TWPE [a] (lb-eq/yr)
423	Steam Electric Power Generating	2,140,000 [b]
430	Pulp, Paper, And Paperboard	1,030,000
419	Petroleum Refining	1,030,000
421	Nonferrous Metals Manufacturing	994,000
418	Fertilizer Manufacturing	826,000
414	Organic Chemicals, Plastics, And Synthetic Fibers	649,000
440	Ore Mining And Dressing	448,000
415	Inorganic Chemicals Manufacturing	299,000
444	Waste Combustors	254,000
410	Textile Mills	250,000

Source: U.S. EPA, 2011d.

Note: Numbers are rounded to three significant figures.

a – Only TWPE totals for the steam electric power generating industry include updates to TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium. The TWPE for all other point source categories is estimated from discharge monitoring reports (DMRs) and Toxic Release Inventory (TRI) reporting and may include double-counting of certain pollutant discharges (*i.e.*, a facility must report a pollutant on both its DMR and its TRI reporting form).

b –EPA calculated the steam electric power generating industry (40 CFR 423) discharges for the alternate scenario analysis as total of 2,140,000 TWPE annually (see Section 10 of the TDD).

EPA estimated that the total alternate scenario analysis TWPE from steam electric power plant wastewater (see Table I-4) is over two times the amount estimated for the pulp, paper, and paperboard industry; petroleum refining industry; and nonferrous metals manufacturing (second, third, and fourth highest ranking), and it is over five times the TWPE for four of the six other industries identified as the top TWPE dischargers in the Final 2010 Effluent Guidelines Program Plan [U.S. EPA, 2011d].[3]

To provide additional perspective on the magnitude of the pollutant loadings from steam electric power plants in the alternate scenario analysis, EPA compared loadings for the evaluated wastestreams to those of an average publicly owned treatment works (POTW). Table I-5 compares the average steam electric pollutant loadings by wastestream[4] to the pollutant loadings from an average POTW assumed to discharge 3 to 5 MGD. EPA also calculated the equivalent number of typical POTWs that would discharge loadings equal to the 151 steam electric power plants[5] included in the alternate scenario analysis. Table I-6 presents total pollutant loadings for

[3] Data sources for the other industry discharges include DMRs and TRI reports. EPA recognizes that the DMR and TRI data have limitations (*e.g.*, only a subset of facilities and a subset of pollutants might be included in the estimated loadings); however, these are the most readily available data sets that represent discharges across the United States.

[4] EPA calculated the average pollutant loadings for each wastestream by dividing the total pollutant loadings for the wastestream by the number of steam electric power plants discharging the wastestream [ERG, 2015a].

[5] The count of 151 steam electric power plants includes three indirect dischargers that discharge wastewater to a POTW and do not discharge any of the evaluated wastestreams directly to surface waters. EPA included these indirect dischargers to protect confidential business information.

the evaluated wastestreams (for the 151 plants) and the number of typical POTWs that would discharge equivalent loadings.

Table I-5. Comparison of Average Pollutant Loadings in the Evaluated Wastestreams to an Average POTW

Pollutant	Average Plant FGD Wastewater Discharge [a,b]		Average Plant Fly Ash Transport Water Discharge [a,c]		Average Plant Bottom Ash Transport Water Discharge [a,d]		Average Plant Combustion Residual Leachate Discharge [a,e]		Average POTW Discharge [a,f]	
	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)	Loadings (lbs/yr)	TWPE (lb-eq/yr)
Aluminum	1,720	111	9,010	583	3,880	251	988	63.9	3,590	215
Arsenic	9.68	33.6	310	1,080	61.1	212	12.7	44.2	45.9	159
Boron	333,000	2,780	19,800	166	2,060	17.2	7,700	64.2	1,540	12.8
Cadmium	91.7	2,090	49.2	1,120	17.7	403	3.39	77.2	3.54	80.6
Chromium VI	(g)	(g)	2.48	1.28	0.145	0.0750	(g)	(g)	17.7	9.02
Copper	19.6	12.2	282	176	83.0	51.7	2.55	1.59	154	95.3
Iron	1,270	7.10	5,740	32.1	6,960	39.0	12,200	68.5	2,530	14.2
Lead	5.82	13.0	157	351	58.6	131	(g)	(g)	48.5	109
Manganese	81,800	8,400	522	53.6	4,340	446	933	95.8	354	36.1
Mercury	6.24	687	7.76	854	3.04	334	0.351	38.7	3,180	350,000
Nickel	701	76.4	188	20.5	275	30.0	15.4	1.68	30.6	3.06
Selenium	1,470	1,640	132	148	29.5	33.1	36.7	41.2	18.5	20.7
Thallium	17.0	48.6	134	384	276	789	0.399	1.14	9.94	28.2
Vanadium	21.0	5.87	209	58.5	12.2	3.42	631	177	No data	No data
Zinc	1,110	52.3	814	38.2	227	10.6	69.8	3.27	453	18.1
Total Nitrogen	132,000	--	25,000	--	22,500	--	(g)	--	123,000	--
Total Phosphorus	453	--	849	--	657	--	(g)	--	17,800	--
Chlorides	10,100,000	246	84,600	2.06	88,500	2.16	142,000	3.45	1,610,000	39.3
TDS	40,800,000	--	1,870,000	--	2,340,000	--	1,200,000	--	No data	--

Note: Numbers are rounded to three significant figures.
a – TWPE presented in the table include updates to TWFs for arsenic, cadmium, copper, manganese, mercury, thallium, and vanadium.
b – Average loadings based on 69 plants assumed to discharge FGD wastewater under baseline conditions [ERG, 2015a].
c – Average loadings based on 40 plants assumed to discharge fly ash transport water under baseline conditions [ERG, 2015a].
d – Average loadings based on 135 plants assumed to discharge bottom ash transport water under baseline conditions [ERG, 2015a].
e – Average loadings based on 70 plants assumed to discharge combustion residual leachate under baseline conditions [ERG, 2015a].
f – Average loadings based on average loadings calculated for POTWs discharging 3 to 5 MGD of wastewater (see DCN SE01961).
g – EPA did not calculate loadings for this pollutant and wastestream. See the Costs and Loads Report (DCN SE05831).

Table I-6. Estimated Number of POTW Equivalents for Total Pollutant Loadings from the Evaluated Wastestreams

Pollutant	Annual Discharge pounds (lbs) [a]	Equivalent Number of Average POTWs [b]
Aluminum	1,070,000	299
Arsenic	22,200	484
Boron	24,600,000	16,000
Cadmium	10,900	3,090
Chromium VI	119	6.72
Copper	24,000	156
Iron	2,110,000	835
Lead	14,600	301
Manganese	6,320,000	17,800
Mercury	1,180	0.370
Nickel	94,200	3,080
Selenium	113,000	6,110
Thallium	43,900	4,410
Vanadium	55,600	No values for comparison
Zinc	145,000	320
Total Nitrogen	13,100,000	107
Total Phosphorus	154,000	8.65
Chlorides	722,000,000	448
TDS	3,290,000,000	No values for comparison

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

a – Annual discharge based on pollutant discharges from 151 steam electric power plants, including three indirect dischargers.

b – Equivalent number of POTWs is estimated by dividing the total annual pollutant loadings from the 151 steam electric power plants by the average POTW loadings presented in Table I-5 for a 4-MGD POTW.

EPA identified the number of surface waters that receive discharges of the evaluated wastestreams and are located in close proximity to sensitive environments. Table I-7 summarizes the number and percentage of immediate receiving waters in the alternate scenario analysis that are located in sensitive environments.

Table I-7. Number and Percentage of Immediate Receiving Waters Identified as Sensitive Environments

Sensitive Environment	Number (Percentage) of Immediate Receiving Waters Identified [a]
Great Lakes watershed	15 (9%)
Chesapeake Bay watershed	11 (6%)
Impaired water	91 (53%)
Surface water impaired for a subset of pollutants associated with the evaluated wastestreams [b]	45 (26%)
Fish consumption advisory water	116 (67%)
Surface water with a fish consumption advisory for a subset of pollutants associated with the evaluated wastestreams [c]	79 (46%)
Drinking water resource within 5 miles	152 (88%)

a – For the sensitive environment proximity analysis, EPA evaluated 172 immediate receiving waters that receive discharges of the evaluated wastestreams [ERG, 2015c; ERG, 2015d].

b – Table B-1 in Appendix B contains a complete list of the impairment categories identified in EPA's 303(d)-listed waters and designates the subset of pollutants evaluated.

c – Table B-2 in Appendix B contains a complete list of the types of advisories identified under the sensitive environment proximity analysis, including pollutants that are not associated with the evaluated wastestreams.

d – The values presented in Section 3.4.5 of the report are based on an analysis of habitat locations that reflect changes in the industry as a result of the CPP.

Table I-8 and Table I-9 present the pollutant loadings to the Great Lakes watershed and the Chesapeake Bay watershed, respectively, accounting for changes in the industry baseline as a result of the CPP. Table I-10 presents the number of immediate receiving waters classified as impaired in the alternate scenario analysis.

Based on a review of immediate receiving waters that reflect changes in the industry as a result of the CPP, EPA determined that 116 immediate receiving waters (67 percent) are under fish consumption advisories; 79 of the immediate receiving waters (46 percent) are under an advisory for a pollutant associated with the evaluated wastestreams.[6] All of these 79 immediate receiving waters are under a fish consumption advisory for mercury and one of the receiving waters is also under a fish consumption advisory for lead.

The results of the threatened and endangered species analysis presented in Section 3.4.5 already account for changes in the industry as a result of the CPP. Table I-11 presents the number of steam electric power plants located within five miles of a drinking water resource and the number of drinking water resources located within five miles of a steam electric power plant.

[6] Table B-2 in Appendix B lists the types of advisories identified under the sensitive environment proximity analysis, including advisories for pollutants that are not associated with the evaluated wastestreams.

Table I-8. Pollutant Loadings to the Great Lakes Watershed from the Evaluated Wastestreams [a]

Pollutant	Annual Discharge to the Great Lakes Watershed (lbs)	Annual TWPE Discharge to the Great Lakes Watershed (lb-eq)
Arsenic	1,030	3,590
Boron	760,000	6,340
Cadmium	286	6,520
Chromium VI	0.548	0.283
Copper	1,170	728
Lead	869	1,950
Manganese	112,000	11,500
Mercury	37.5	4,130
Nickel	4,310	470
Selenium	3,540	3,960
Thallium	4,320	12,300
Zinc	3,860	181
Total Nitrogen	646,000	--
Total Phosphorus	10,900	--
Chlorides	24,100,000	587
Total Dissolved Solids	116,000,000	--

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

a – Pollutant loadings based on 14 steam electric power plants discharging to 15 immediate receiving waters in the Great Lakes watershed.

Table I-9. Pollutant Loadings to the Chesapeake Bay Watershed from the Evaluated Wastestreams [a]

Pollutant	Annual Discharge to the Chesapeake Bay Watershed (lbs)	Annual TWPE Discharge to the Chesapeake Bay Watershed (lb-eq)
Arsenic	680	2,360
Boron	1,080,000	9,000
Cadmium	199	4,530
Chromium VI	0	0
Copper	765	477
Lead	571	1,280
Manganese	106,000	10,900
Mercury	24.4	2,690
Nickel	2,880	313
Selenium	4,710	5,290
Thallium	2,880	8,210
Zinc	2,630	123
Total Nitrogen	670,000	--
Total Phosphorus	7,920	--
Chlorides	34,200,000	832
Total Dissolved Solids	139,000,000	--

Source: ERG, 2015a.

Note: Numbers are rounded to three significant figures.

a – Pollutant loadings based on seven steam electric power plants discharging to 11 immediate receiving waters in the Chesapeake Bay watershed.

Table I-10. Number and Percentage of Immediate Receiving Waters Classified as Impaired for a Pollutant Associated with the Evaluated Wastestreams

Pollutant Causing Impairment	Number (Percentage) of Immediate Receiving Waters Identified [a]
Mercury	21 (12%)
Metals, other than mercury [b]	24 (14%)
Nutrients	15 (9%)
TDS, including chlorides	2 (1%)
Total for Any Pollutant [c]	**56 (33%)**

a – For the impaired waters proximity analysis, EPA evaluated 172 immediate receiving waters that receive discharges of the evaluated wastestreams [ERG, 2015c; ERG, 2015d].

b – The EPA impaired water database listed 24 immediate receiving waters as impaired based on the “metal, other than mercury” impairment category. Of those 24 immediate receiving waters, 13 receiving waters are also listed as impaired for one or more specific metals in the EA analysis (arsenic, cadmium, manganese, selenium, and zinc). One additional immediate receiving water is impaired for boron (but not included in the “metals, other than mercury” impairment category).

c – Total does not equal the sum of the immediate receiving waters listed in the table. Some immediate receiving waters are impaired for multiple pollutants.

Table I-11. Comparison of Number and Percentage of Steam Electric Power Plants Located within 5 Miles of a Drinking Water Resource

Type of Drinking Water Resource	Number of Drinking Water Resources within 5 Miles of a Steam Electric Power Plant	Number (Percentage) of Steam Electric Power Plants Located within 5 Miles of a Drinking Water Resource [a]
Intakes and reservoirs	87	52 (35%)
Public wells [b]	1,530	116 (78%)
Sole-source aquifers	5	5 (3%)

Sources: ERG, 2015c; ERG, 2015d.

a – For the drinking water resource proximity analysis, EPA evaluated 172 immediate receiving waters that receive discharges of the evaluated wastestreams from 148 steam electric power plants.

b – Counts include two springs and 29 wellheads.

Current impacts from the steam electric power generating industry under the alternate scenario analysis include water quality impacts (Table I-12); wildlife impacts (Table I-13 and Table I-14); impacts to benthic organisms (Table I-15); human health impacts to national-scale cohorts representing recreational and subsistence fishers (Table I-16 through Table I-19); and human health impacts to cohorts representing recreational and subsistence fishers by race or Hispanic origin (Table I-20 and Table I-21, respectively).

The ecological risk modeling results under the alternate scenario analysis indicate that 16 percent of the lakes, ponds, and reservoirs (3 out of 19) and 13 percent of the rivers and streams (18 out of 144) that receive discharges of the evaluated wastestreams present an elevated risk of negative reproductive impacts to fish. For mallards, the counts are slightly higher, with the same number of lakes, ponds, and reservoirs and 15 percent of the rivers and streams (22 out of 144) presenting these risks.

Selecting the 90th percentile modeled egg/ovary concentration, meaning there is a 10 percent probability that the egg/ovary concentrations are greater than the selected concentration, reveals that 19 percent of the immediate receiving waters (31 out of 163) present reproductive risks to at least 10 percent of the exposed fish population. The results for mallards (20 percent) are very similar. These counts are considerably higher than the results obtained using the median modeled egg/ovary concentration, indicating the potential for more widespread ecological impacts among those waterbodies and food webs that tend to experience higher bioaccumulation of selenium.

Table I-12. Number and Percentage of Immediate Receiving Waters with Estimated Water Concentrations that Exceed the Water Quality Criteria

Evaluation Criterion		Number of Immediate Receiving Waters Exceeding a Criterion [a]			
		Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Immediate Receiving Waters [b]	
				Number Exceeding	Percentage Exceeding
Aquatic Life Criteria	Freshwater Acute NRWQC	7	0	7	4%
	Freshwater Chronic NRWQC	25	3	28	17%
Human Health Criteria	Human Health Water and Organism NRWQC	61	12	73	45%
	Human Health Organism Only NRWQC	44	7	51	31%
	Drinking Water MCL	25	4	29	18%
Total Number of Unique Immediate Receiving Waters [c]		61	12	73	45%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: NRWQC (National Recommended Water Quality Criteria); MCL (maximum contaminant level).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters (144 rivers and streams; 19 lakes, ponds, and reservoirs) and loadings from 143 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

c – This represents the number of unique immediate receiving waters that exceeded at least one criterion.

Table I-13. Number and Percentage of Immediate Receiving Waters That Exceed Wildlife Fish Consumption NEHCs for Minks and Eagles (by Waterbody Type)

Evaluation Criterion	Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Receiving Waters [a,b]	
			Number Exceeding	Percentage Exceeding
Mink fish consumption NEHC	38	8	46	28%
Eagle fish consumption NEHC	48	8	56	34%
Total Number of Unique Immediate Receiving Waters [c]	48	8	56	34%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i

Acronyms: NEHC (No Effect Hazard Concentration).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters (144 rivers and streams; 19 lakes, ponds, and reservoirs) and loadings from 143 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

c – This represents the number of unique immediate receiving waters that exceed a criterion.

Table I-14. Number and Percentage of Immediate Receiving Waters That Exceed Wildlife Fish Consumption NEHCs for Minks and Eagles (by Pollutant)

Pollutant	Mink			Eagle		
	Fish Consumption NEHC (ug/g) [a]	Immediate Receiving Waters		Fish Consumption NEHC (ug/g) [a]	Immediate Receiving Waters	
		Number Exceeding [b]	Percentage Exceeding		Number Exceeding [b]	Percentage Exceeding
Arsenic	7.65	0	0%	22.4	0	0%
Cadmium	5.66	5	3%	14.7	4	2%
Chromium VI	17.7 [c]	0	0%	26.6 [c]	0	0%
Copper	41.2	0	0%	40.5	0	0%
Lead	34.6	0	0%	16.3	2	1%
Mercury	0.37	43	26%	0.5	55	34%
Nickel	12.5	0	0%	67.1	0	0%
Selenium	1.13	33	20%	4	33	20%
Thallium	ID	NC	NC	ID	NC	NC
Zinc	904	1	1%	145	4	2%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: ID (Insufficient data; no benchmarks were identified in the wildlife analysis for thallium); NC (Not calculated); NEHC (No Effect Hazard Concentration); ug/g (micrograms/gram).

a – The wildlife fish consumption NEHC represents the maximum pollutant concentration in the fish that will result in no observable adverse effects in wildlife (*i.e.*, minks or eagles) [USGS, 2008].

b – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

c – An NEHC benchmark is not available for chromium VI; therefore, EPA used the total chromium benchmark.

Table I-15. Number and Percentage of Immediate Receiving Waters with Sediment Pollutant Concentrations Exceeding TELs for Sediment Biota

Pollutant	Sediment Benchmark (mg/kg)	Number of Immediate Receiving Waters Exceeding TELs for Sediment Biota			
		Rivers and Streams	Lakes, Ponds, and Reservoirs	Total Immediate Receiving Waters	
				Number [a]	Percent
Arsenic	5.90	5	0	5	3%
Cadmium	0.596	19	3	22	13%
Chromium VI [b]	37.3	0	0	0	0%
Copper	35.7	4	1	5	3%
Lead	35	3	1	4	2%
Mercury	0.174	33	7	40	25%
Nickel	18.0	24	3	27	17%
Selenium	ID	NC	NC	NC	NC
Thallium	ID	NC	NC	NC	NC
Zinc	123	12	1	13	8%
Total Number of Unique Immediate Receiving Waters		**33**	**7**	**40**	**25%**

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: ID (Insufficient data; no benchmarks were identified); NC (Not calculated).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters (144 rivers and streams; 19 lakes, ponds, and reservoirs) and loadings from 143 steam electric power plants.

b – No benchmark for chromium VI. EPA used the total chromium benchmark, which may underestimate the impact to wildlife.

Table I-16. Number and Percentage of Immediate Receiving Waters That Exceed Human Health Evaluation Criteria (Lifetime Excess Cancer Risk) for Inorganic Arsenic

Receptor	Cohort	Exposure Duration (Years)	Number of Immediate Receiving Waters Where Lifetime Excess Cancer Risk Exceeds 1-in-a-Million [a,b]			
			Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Receiving Waters [c]	
					Number Exceeding	Percentage Exceeding
Child recreational fisher	1 to <2 years	1	4	0	4	2%
	2 to <3 years	1	4	0	4	2%
	3 to <6 years	3	4	0	4	2%
	6 to <11 years	5	4	0	4	2%
	11 to <16 years	5	4	0	4	2%
	16 to <21 years	5	4	0	4	2%
Adult recreational fisher		49	7	2	9	6%
Child subsistence fisher	1 to <2 years	1	4	0	4	2%
	2 to <3 years	1	4	0	4	2%
	3 to <6 years	3	5	0	5	3%
	6 to <11 years	5	6	0	6	4%
	11 to <16 years	5	4	0	4	2%
	16 to <21 years	5	4	0	4	2%
Adult subsistence fisher		49	19	2	21	13%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters (144 rivers and streams; 19 lakes, ponds, and reservoirs) and loadings from 143 steam electric power plants.

b – Inorganic arsenic cancer slope factor of 1.5 per milligrams per kilogram (mg/kg) per day.

c – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

Table I-17. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values

Receptor	Cohort	Exposure Duration (Years)	Number of Immediate Receiving Waters where Estimated Exposure Doses Exceed Non-Cancer Reference Doses [a]			
			Number of Rivers and Streams	Number of Lakes, Ponds, and Reservoirs	Total Receiving Waters [b]	
					Number Exceeding	Percentage Exceeding
Child recreational fisher	1 to <2 years	1	62	13	75	46%
	2 to <3 years	1	62	13	75	46%
	3 to <6 years	3	61	13	74	45%
	6 to <11 years	5	60	12	72	44%
	11 to <16 years	5	57	10	67	41%
	16 to <21 years	5	57	10	67	41%
Adult recreational fisher		49	57	10	67	41%
Child subsistence fisher	1 to <2 years	1	76	14	90	55%
	2 to <3 years	1	76	14	90	55%
	3 to <6 years	3	70	14	84	52%
	6 to <11 years	5	67	14	81	50%
	11 to <16 years	5	63	13	76	47%
	16 to <21 years	5	63	13	76	47%
Adult subsistence fisher		49	65	13	78	48%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters (144 rivers and streams; 19 lakes, ponds, and reservoirs) and loadings from 143 steam electric power plants.

b – These values are the sum and percentage of rivers, streams, lakes, ponds, and reservoirs impacted.

Table I-18. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values at Baseline by Pollutant

Pollutant	Oral Reference Dose (mg/kg/day)	Number of Immediate Receiving Waters where Estimated Exposure Doses Exceed Non-Cancer Reference Doses [a]	
		Number Exceeding	Percentage Exceeding
Inorganic arsenic	0.0003 [b]	3	2%
Cadmium	0.001 [b]	27	17%
Chromium VI	0.003 [b]	0	0%
Copper	0.01 [c]	4	2%
Lead	ID	NC	NC
Mercury (as methylmercury)	0.0001 [b]	84	52%
Nickel (soluble salts)	0.02 [b]	0	0%
Selenium	0.005 [b]	41	25%
Thallium (soluble salts)	0.00001 [d]	72	44%
Zinc	0.3 [b]	7	4%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: NC (Not calculated); ID (Insufficient data; there is no current reference dose for lead).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – U.S. EPA, 2011c.

c – ATSDR, 2010a.

d – U.S. EPA, 2010a.

Table I-19. Comparison of T4 Fish Tissue Concentrations to Fish Advisory Screening Values

Pollutant	Recreational Fishers			Subsistence Fishers		
	Screening Value (ppm)[a]	Number Exceeding [b]	Percentage Exceeding	Screening Value (ppm) [a]	Number Exceeding [b]	Percentage Exceeding
Inorganic arsenic (noncarcinogen)	1.2	0	0%	0.147	3	2%
Inorganic arsenic (carcinogen)	0.026	4	2%	0.00327	7	4%
Cadmium	4.0	6	4%	0.491	18	11%
Mercury (as methylmercury)	0.4	58	36%	0.049	77	47%
Selenium	20	19	12%	2.457	36	22%

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: ppm (parts per million).

a – Screening values are defined as concentrations of target analytes in fish or shellfish tissue that are of potential public health concern and that are used as threshold values against which levels of contamination in similar tissue collected from the ambient environment can be compared. Exceedance of these screening values indicates that more intensive site-specific monitoring and/or evaluation of human health risk should be conducted [U.S. EPA, 2000a, Table 5-3].

b – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

Table I-20. Number and Percentage of Immediate Receiving Waters That Exceed Human Health Evaluation Criteria (Lifetime Excess Cancer Risk) for Inorganic Arsenic, by Race or Hispanic Origin

Receptor	Race or Hispanic Origin	Number of Immediate Receiving Waters Where Lifetime Excess Cancer Risk Exceeds 1-in-a-Million [a,b]						
		1 to <2 years	2 to <3 years	3 to <6 years	6 to <11 years	11 to <16 years	16 to <21 years	Adult
Recreational	Non-Hispanic White	3	3	4	4	4	4	9
	Non-Hispanic Black	3	3	4	4	4	4	11
	Mexican-American	4	4	4	4	4	4	14
	Other Hispanic	4	4	4	4	4	4	13
	Other, including Multiple Races	4	4	4	4	4	4	15
Subsistence	Non-Hispanic White	4	4	4	5	5	5	21
	Non-Hispanic Black	4	4	4	5	5	5	22
	Mexican-American	4	4	4	6	6	6	23
	Other Hispanic	4	4	4	5	5	5	23
	Other, including Multiple Races	4	4	5	7	7	7	26

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – Inorganic arsenic cancer slope factor of 1.5 per milligrams per kilogram (mg/kg) per day.

Table I-21. Number and Percentage of Immediate Receiving Waters That Exceed Non-Cancer Oral Reference Dose Values, by Race or Hispanic Origin

Receptor	Race or Hispanic Origin	Number of Immediate Receiving Waters Where Pollutant Exceeds a Non-Cancer Reference Dose [a]						
		Inorganic Arsenic	Cadmium	Copper	Mercury [b]	Selenium	Thallium [c]	Zinc
Recreational, Child Fisher	Non-Hispanic White	0 (0%)	8 (5%)	3 (2%)	63 (39%)	26 (16%)	44 (27%)	4 (2%)
	Non-Hispanic Black	0 (0%)	9 (6%)	4 (2%)	64 (39%)	27 (17%)	45 (28%)	4 (2%)
	Mexican-American	0 (0%)	11 (7%)	4 (2%)	66 (40%)	27 (17%)	48 (29%)	4 (2%)
	Other Hispanic	0 (0%)	10 (6%)	4 (2%)	64 (39%)	27 (17%)	47 (29%)	4 (2%)
	Other, including Multiple Races	0 (0%)	11 (7%)	4 (2%)	68 (42%)	28 (17%)	48 (29%)	4 (2%)
Subsistence, Child Fisher	Non-Hispanic White	0 (0%)	8 (5%)	3 (2%)	63 (39%)	26 (16%)	44 (27%)	4 (2%)
	Non-Hispanic Black	0 (0%)	9 (6%)	4 (2%)	64 (39%)	27 (17%)	45 (28%)	4 (2%)
	Mexican-American	0 (0%)	11 (7%)	4 (2%)	66 (40%)	27 (17%)	48 (29%)	4 (2%)
	Other Hispanic	0 (0%)	10 (6%)	4 (2%)	64 (39%)	27 (17%)	47 (29%)	4 (2%)
	Other, including Multiple Races	0 (0%)	11 (7%)	4 (2%)	68 (42%)	28 (17%)	48 (29%)	4 (2%)
Recreational, Adult Fisher	Non-Hispanic White	3 (2%)	17(10%)	4 (2%)	74 (45%)	33 (20%)	58 (36%)	4 (2%)
	Non-Hispanic Black	3 (2%)	18 (11%)	4 (2%)	74 (45%)	34 (21%)	58 (36%)	4 (2%)
	Mexican-American	3 (2%)	20 (12%)	4 (2%)	76 (47%)	36 (22%)	60 (37%)	5 (3%)
	Other Hispanic	3 (2%)	20 (12%)	4 (2%)	76 (47%)	36 (22%)	60 (37%)	5 (3%)
	Other, including Multiple Races	3 (2%)	24 (15%)	4 (2%)	79 (48%)	38 (23%)	67 (41%)	5 (3%)
Subsistence, Adult Fisher	Non-Hispanic White	3 (2%)	17(10%)	4 (2%)	74 (45%)	33 (20%)	58 (36%)	4 (2%)
	Non-Hispanic Black	3 (2%)	18 (11%)	4 (2%)	74 (45%)	34 (21%)	58 (36%)	4 (2%)
	Mexican-American	3 (2%)	20 (12%)	4 (2%)	76 (47%)	36 (22%)	60 (37%)	5 (3%)
	Other Hispanic	3 (2%)	20 (12%)	4 (2%)	76 (47%)	36 (22%)	60 (37%)	5 (3%)
	Other, including Multiple Races	3 (2%)	24 (15%)	4 (2%)	79 (48%)	38 (23%)	67 (41%)	5 (3%)

Sources: ERG, 2015d; ERG, 2015h; ERG, 2015i.

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – Mercury, as methylmercury.

c – Reference dose based on thallium (soluble salts).

EPA evaluated environmental improvements as a result of the regulatory options, reflecting changes in the industry as a result of the CPP. Table I-22 and Table I-23 present pollutant removals under the regulatory options.

Table I-22. Steam Electric Power Generating Industry Pollutant Removals for Metals, Bioaccumulative Pollutants, Nutrients, Chlorides, and TDS Under Regulatory Options

Pollutant	Pollutant Removals, lbs/yr (Percent Reduction) [a]				
	Option A	Option B	Option C	Option D	Option E
Arsenic	12,500 (56%)	12,500 (56%)	18,500 (83%)	20,700 (93%)	21,300 (96%)
Boron	3,150,000 (13%)	3,150,000 (13%)	3,350,000 (14%)	3,420,000 (14%)	3,420,000 (14%)
Cadmium	7,900 (72%)	7,900 (72%)	9,650 (88%)	10,300 (94%)	10,400 (95%)
Chromium VI	99.1 (83%)	99.1 (83%)	115 (96%)	119 (>99%)	119 (>99%)
Copper	12,200 (51%)	12,200 (51%)	20,500 (85%)	23,400 (98%)	23,500 (98%)
Lead	6,340 (43%)	6,340 (43%)	12,100 (83%)	14,200 (98%)	14,200 (98%)
Manganese	4,520,000 (72%)	4,520,000 (72%)	4,950,000 (78%)	5,110,000 (81%)	5,110,000 (81%)
Mercury	728 (62%)	736 (63%)	1,040 (89%)	1,140 (97%)	1,160 (99%)
Nickel	55,100 (58%)	55,300 (59%)	82,300 (87%)	92,400 (98%)	93,100 (99%)
Selenium	24,100 (21%)	106,000 (94%)	109,000 (96%)	110,000 (97%)	110,000 (97%)
Thallium	5,640 (13%)	5,640 (13%)	32,700 (74%)	42,800 (98%)	42,800 (98%)
Zinc	107,000 (74%)	107,000 (74%)	130,000 (89%)	138,000 (95%)	141,000 (97%)
Nitrogen, total [b]	1,590,000 (12%)	10,000,000 (76%)	12,200,000 (93%)	13,100,000 (99%)	13,100,000 (99%)
Phosphorus, total	33,900 (22%)	33,900 (22%)	98,300 (64%)	122,000 (79%)	122,000 (79%)
Chlorides	3,380,000 (<1%)	3,380,000 (<1%)	12,000,000 (2%)	15,300,000 (2%)	15,300,000 (2%)
TDS	684,000,000 (21%)	684,000,000 (21%)	913,000,000 (28%)	999,000,000 (30%)	999,000,000 (30%)

Source: ERG, 2015a.

Acronyms: TDS (Total Dissolved Solids); lbs/yr (pounds per year).

Note: Pollutant removals are rounded to three significant figures.

a – .>0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

Table I-23. Steam Electric Power Generating Industry TWPE Removals for Metals, Bioaccumulative Pollutants, Nutrients, Chlorides, and TDS Under Regulatory Options

Pollutant	Pollutant Removals, TWPE/year (Percent Reduction) [a]				
	Option A	Option B	Option C	Option D	Option E
Arsenic	43,400 (56%)	43,400 (56%)	64,200 (83%)	71,900 (93%)	73,900 (96%)
Boron	26,200 (13%)	26,200 (13%)	28,000 (14%)	28,600 (14%)	28,600 (14%)
Cadmium	180,000 (72%)	180,000 (72%)	220,000 (88%)	234,000 (94%)	236,000 (95%)
Chromium VI	51.2 (83%)	51.2 (83%)	59.2 (96%)	61.3 (>99%)	61.3 (>99%)
Copper	7,630 (51%)	7,630 (51%)	12,800 (85%)	14,600 (98%)	14,600 (98%)
Lead	14,200 (43%)	14,200 (43%)	27,200 (83%)	31,900 (98%)	31,900 (98%)
Manganese	464,000 (72%)	464,000 (72%)	508,000 (78%)	524,000 (81%)	524,000 (81%)
Mercury	80,100 (62%)	80,900 (63%)	115,000 (89%)	126,000 (97%)	128,000 (99%)
Nickel	6,000 (58%)	6,020 (59%)	8,970 (87%)	10,100 (98%)	10,100 (99%)
Selenium	27,000 (21%)	119,000 (94%)	122,000 (96%)	123,000 (97%)	123,000 (97%)
Thallium	16,100 (13%)	16,100 (13%)	93,300 (74%)	122,000 (98%)	122,000 (98%)
Zinc	5,040 (74%)	5,040 (74%)	6,090 (89%)	6,470 (95%)	6,630 (97%)
Nitrogen, total	N/A	N/A	N/A	N/A	N/A
Phosphorus, total	N/A	N/A	N/A	N/A	N/A
Chlorides	82.2 (<1%)	82.2 (<1%)	293 (2%)	372 (2%)	372 (2%)
TDS	N/A	N/A	N/A	N/A	N/A

Source: ERG, 2015a.

Acronyms: TDS (Total Dissolved Solids); TWPE (Toxic Weighted Pound Equivalents).

Note: Pollutant removals are rounded to three significant figures.

N/A – The TWPE/year is not provided for total nitrogen, total phosphorus, and TDS because EPA has not established a toxic weighting factor (TWF) for these pollutants.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table I-24 presents key environmental improvements as a result of the regulatory options and reflecting changes in the industry as a result of the CPP. Table I-25 shows environmental improvements for benthic organisms. Key environmental improvements based on reduced discharges of arsenic, mercury, selenium, cadmium, and thallium are included in Table I-26 through Table I-30.

Table I-24. Key Environmental Improvements Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	7	4%	5 (29%)	5 (29%)	5 (29%)	3 (57%)	2 (71%)
Freshwater Chronic NRWQC	28	17%	27 (4%)	22 (21%)	18 (36%)	16 (43%)	16 (43%)
Human Health Water and Organism NRWQC	73	45%	70 (4%)	70 (4%)	55 (25%)	42 (42%)	35 (52%)
Human Health Organism Only NRWQC	51	31%	48 (6%)	48 (6%)	36 29%)	28 (45%)	22 (57%)
Drinking Water MCL	29	18%	27 (7%)	26 (10%)	12 (59%)	6 (79%)	6 (79%)
Wildlife Results							
Fish Ingestion NEHC for Minks	46	28%	46 (0%)	41 (11%)	25 (46%)	19 (59%)	18 (61%)
Fish Ingestion NEHC for Eagles	56	34%	52 (7%)	48 (14%)	34 (39%)	23 (59%)	20 (64%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	75	46%	69 (8%)	67 (11%)	51 (32%)	38 (49%)	30 (60%)
Non-Cancer Reference Dose for Adult (recreational)	67	41%	60 (10%)	58 (13%)	44 (34%)	32 (52%)	23 (66%)
Non-Cancer Reference Dose for Child (subsistence)	90	55%	81 (10%)	79 (12%)	59 (34%)	43 (52%)	39 (57%)
Non-Cancer Reference Dose for Adult (subsistence)	78	48%	72 (8%)	71 (9%)	54 (31%)	40 (49%)	32 (59%)

Table I-24. Key Environmental Improvements Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	**Percentage**	**Option A**	**Option B**	**Option C**	**Option D**	**Option E**
Human Health Results—Cancer							
Arsenic Cancer Risk for Child (recreational)	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	2 (50%)
Arsenic Cancer Risk for Adult (recreational)	9	6%	7 (22%)	7 (22%)	5 (44%)	3 (67%)	2 (78%)
Arsenic Cancer Risk for Child (subsistence)	6	4%	6 (0%)	6 (0%)	5 (17%)	3 (50%)	2 (67%)
Arsenic Cancer Risk for Adult (subsistence)	21	13%	19 (10%)	19 (10%)	13 (38%)	11 (48%)	4 (81%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (maximum contaminant level); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table I-25. Number of Immediate Receiving Waters with Sediment Pollutant Concentrations Exceeding TELs for Sediment Biota Under the Regulatory Options

Pollutant	Modeled Immediate Receiving Waters Exceeding CSCLs Under Baseline Conditions [a]	Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
		Option A	Option B	Option C	Option D	Option E
Arsenic	5 (3%)	4 (20%)	4 (20%)	4 (20%)	3 (40%)	2 (60%)
Cadmium	22 (13%)	17 (23%)	17 (23%)	12 (45%)	10 (55%)	8 (64%)
Chromium VI [c]	0 (0%)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Copper	5 (3%)	4 (20%)	4 (20%)	4 (20%)	2 (60%)	2 (60%)
Lead	4 (2%)	3 (25%)	3 (25%)	3 (25%)	1 (75%)	1 (75%)
Mercury	40 (25%)	36 (10%)	35 (13%)	20 (50%)	16 (60%)	7 (83%)
Nickel	27 (17%)	22 (19%)	22 (19%)	12 (56%)	10 (63%)	4 (85%)
Selenium	NC	NC	NC	NC	NC	NC
Thallium	NC	NC	NC	NC	NC	NC
Zinc	13 (8%)	7 (46%)	7 (46%)	7 (46%)	6 (54%)	2 (85%)
Total	**40 (25%)**	**36 (10%)**	**35 (13%)**	**21 (48%)**	**17 (58%)**	**8 (80%)**

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: CSCL (Chemical stressor concentration limit); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NC (Not calculated; no benchmark for comparison).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

c – EPA used the total chromium benchmark for this analysis.

Table I-26. Key Environmental Improvements for Arsenic Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	3	2%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)
Freshwater Chronic NRWQC	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	1 (75%)
Human Health Water and Organism NRWQC	73	45%	70 (4%)	70 (4%)	55 (25%)	42 (42%)	35 (52%)
Human Health Organism Only NRWQC	51	31%	48 (6%)	48 (6%)	36 (29%)	28 (45%)	22 (57%)
Drinking Water MCL	9	6%	7 (22%)	7 (22%)	5 (44%)	3 (67%)	2 (78%)
Wildlife Results							
Fish Ingestion NEHC for Minks	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Fish Ingestion NEHC for Eagles	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	2	1%	1 (50%)	1 (50%)	1 (50%)	1 (50%)	0 (100%)
Non-Cancer Reference Dose for Adult (recreational)	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Non-Cancer Reference Dose for Child (subsistence)	3	2%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)
Non-Cancer Reference Dose for Adult (subsistence)	3	2%	2 (33%)	2 (33%)	2 (33%)	2 (33%)	1 (67%)

Table I-26. Key Environmental Improvements for Arsenic Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Human Health Results—Cancer							
Arsenic Cancer Risk for Child (recreational)	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	2 (50%)
Arsenic Cancer Risk for Adult (recreational)	9	6%	7 (22%)	7 (22%)	5 (44%)	3 (67%)	2 (78%)
Arsenic Cancer Risk for Child (subsistence)	6	4%	6 (0%)	6 (0%)	5 (17%)	3 (50%)	2 (67%)
Arsenic Cancer Risk for Adult (subsistence)	21	13%	19 (10%)	19 (10%)	13 (38%)	11 (48%)	4 (81%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table I-27. Key Environmental Improvements for Mercury Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	0	0%	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Freshwater Chronic NRWQC	1	1%	0 (100%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)
Human Health Water and Organism NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Organism Only NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Drinking Water MCL	4	2%	4 (0%)	4 (0%)	4 (0%)	2 (50%)	1 (75%)
Wildlife Results							
Fish Ingestion NEHC for Minks	43	26%	40 (7%)	39 (9%)	23 (47%)	17 (60%)	8 (81%)
Fish Ingestion NEHC for Eagles	55	34%	48 (13%)	48 (13%)	34 (38%)	23 (58%)	17 (69%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	72	44%	65 (10%)	62 (14%)	46 (36%)	35 (51%)	27 (63%)
Non-Cancer Reference Dose for Adult (recreational)	64	39%	55 (14%)	54 (16%)	41 (36%)	30 (53%)	20 (69%)
Non-Cancer Reference Dose for Child (subsistence)	84	52%	74 (12%)	73 (13%)	55 (35%)	41 (51%)	37 (56%)
Non-Cancer Reference Dose for Adult (subsistence)	75	46%	68 (9%)	66 (12%)	49 (35%)	37 (51%)	29 (61%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table I-28. Key Environmental Improvements for Selenium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Freshwater Chronic NRWQC	27	17%	25 (7%)	17 (37%)	16 (41%)	14 (48%)	14 (48%)
Human Health Water and Organism NRWQC	8	5%	7 (13%)	3 (63%)	3 (63%)	2 (75%)	2 (75%)
Human Health Organism Only NRWQC	1	1%	1 (0%)	1 (0%)	1 (0%)	1 (0%)	1 (0%)
Drinking Water MCL	10	6%	9 (10%)	4 (60%)	4 (60%)	3 (70%)	3 (70%)
Wildlife Results							
Fish Ingestion NEHC for Minks	33	20%	32 (3%)	23 (30%)	19 (42%)	17 (48%)	17 (48%)
Fish Ingestion NEHC for Eagles	33	20%	32 (3%)	23 (30%)	19 (42%)	17 (48%)	17 (48%)
Negative Reproductive Effects in Fish [c]	21	13%	17 (19%)	9 (57%)	9 (57%)	8 (62%)	8 (62%)
Negative Reproductive Effects in Mallards [c]	25	15%	21 (16%)	13 (48%)	12 (52%)	11 (56%)	11 (56%)

Table I-28. Key Environmental Improvements for Selenium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	33	20%	32 (3%)	23 (30%)	19 (42%)	17 (48%)	17 (48%)
Non-Cancer Reference Dose for Adult (recreational)	26	16%	23 (12%)	14 (46%)	14 (46%)	13 (50%)	13 (50%)
Non-Cancer Reference Dose for Child (subsistence)	41	25%	39 (5%)	31 (24%)	28 (32%)	24 (41%)	24 (41%)
Non-Cancer Reference Dose for Adult (subsistence)	34	21%	32 (6%)	23 (32%)	19 (44%)	17 (50%)	17 (50%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

c – These rows indicate the number of immediate receiving waters whose median modeled egg/ovary concentration is predicted to result in reproductive impacts among at least 10 percent of the exposed fish or mallard population, as determined using the ecological risk model.

Table I-29. Key Environmental Improvements for Cadmium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	7	4%	4 (43%)	4 (43%)	4 (43%)	3 (57%)	2 (71%)
Freshwater Chronic NRWQC	23	14%	18 (22%)	18 (22%)	13 (43%)	11 (52%)	9 (61%)
Human Health Water and Organism NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Organism Only NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Drinking Water MCL	8	5%	6 (25%)	6 (25%)	5 (38%)	3 (63%)	2 (75%)
Wildlife Results							
Fish Ingestion NEHC for Minks	5	3%	4 (20%)	4 (20%)	4 (20%)	2 (60%)	2 (60%)
Fish Ingestion NEHC for Eagles	4	2%	3 (25%)	3 (25%)	3 (25%)	2 (50%)	2 (50%)
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	13	8%	9 (31%)	9 (31%)	7 (46%)	5 (62%)	3 (77%)
Non-Cancer Reference Dose for Adult (recreational)	8	5%	6 (25%)	6 (25%)	5 (38%)	3 (63%)	2 (75%)
Non-Cancer Reference Dose for Child (subsistence)	27	17%	22 (19%)	22 (19%)	17 (37%)	15 (44%)	10 (63%)
Non-Cancer Reference Dose for Adult (subsistence)	18	11%	13 (28%)	13 (28%)	9 (50%)	7 (61%)	4 (78%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Table I-30. Key Environmental Improvements for Thallium Under the Regulatory Options

Evaluation Benchmark	Modeled Immediate Receiving Waters Exceeding Benchmark Under Baseline Conditions [a]		Number of Immediate Receiving Waters Exceeding Benchmark (Percent Reduction from Baseline Conditions) Under the Regulatory Options [b]				
	Number	Percentage	Option A	Option B	Option C	Option D	Option E
Water Quality Results							
Freshwater Acute NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Freshwater Chronic NRWQC	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Water and Organism NRWQC	39	24%	36 (8%)	36 (8%)	22 (44%)	12 (69%)	12 (69%)
Human Health Organism Only NRWQC	35	21%	32 (9%)	32 (9%)	18 (49%)	8 (77%)	8 (77%)
Drinking Water MCL	27	17%	25 (7%)	25 (7%)	11 (59%)	5 (81%)	5 (81%)
Wildlife Results							
Fish Ingestion NEHC for Minks	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Fish Ingestion NEHC for Eagles	No benchmark for comparison		N/A	N/A	N/A	N/A	N/A
Human Health Results—Non-Cancer							
Non-Cancer Reference Dose for Child (recreational)	55	34%	54 (2%)	54 (2%)	36 (35%)	23 (58%)	23 (58%)
Non-Cancer Reference Dose for Adult (recreational)	43	26%	41 (5%)	41 (5%)	26 (40%)	16 (63%)	16 (63%)
Non-Cancer Reference Dose for Child (subsistence)	72	44%	69 (4%)	69 (4%)	47 (35%)	30 (58%)	30 (58%)
Non-Cancer Reference Dose for Adult (subsistence)	58	36%	58 (0%)	58 (0%)	39 (33%)	25 (57%)	25 (57%)

Source: ERG, 2015d; ERG, 2015h; ERG, 2015i.

Acronyms: MCL (Maximum contaminant level); N/A (Not Applicable, no exceedances at baseline conditions to compare option results); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

Under the alternate scenario analysis, EPA evaluated environmental improvements to sensitive waters as a result of the regulatory options and reflecting changes in the industry as a result of the CPP. EPA determined that 91 of the immediate receiving waters are 303(d)-listed waterbodies, designated as impaired for one or more pollutants found in the evaluated wastestreams.[7] Table I-31 presents the pollutant removals to impaired waters under the regulatory options.

EPA determined that 79 of the 172 immediate receiving waters included in the alternate scenario analysis are under a fish advisory for mercury. Under the final rule, the number of immediate receiving waters with fish that exceed EPA's mercury screening value for recreational fishers (based on steam electric power plant discharges only) will decrease by 59 percent, thereby reducing the potential threat to human health from consuming contaminated fish.

Under the alternate scenario analysis, EPA identified 14 steam electric power plants that discharge into the Great Lakes watershed. Table I-32 presents the pollutant removals to the Great Lakes watershed under the regulatory options considered by EPA.

Under the alternate scenario analysis, EPA identified seven steam electric power plants that discharge to the Chesapeake Bay watershed. Under the final rule, EPA estimates the following pollutant removals to the Chesapeake Bay watershed:

- 603 pounds of arsenic annually (89 percent reduction).
- 167 pounds of cadmium annually (84 percent reduction).
- 555 pounds of lead annually (97 percent reduction).
- 22.8 pounds of mercury annually (93 percent reduction).
- 4,550 pounds of selenium annually (96 percent reduction).
- 2,830 pounds of thallium annually (98 percent reduction).
- 667,000 pounds of total nitrogen annually (>99 percent reduction).
- 6,450 pounds of total phosphorus annually (81 percent reduction).

Finally, EPA evaluated the improvements to downstream receiving waters. Table I-33 presents the number of river miles impacted by steam electric power plant discharges at baseline and under the regulatory options for the alternate scenario analysis. The table also presents the percent reduction in number of impacted river miles.

[7] The count of impaired waters excludes the general impairment category "metals (not mercury)" and includes receiving waters impaired for arsenic, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc, phosphorous, nutrients, TDS, or chlorides.

Table I-31. Pollutant Removals to Impaired Waters by Impairment Type

Impairment Type/Number of Receiving Waters [b]	Pollutant	Baseline Loadings (lbs/yr)	Pollutant Removals (lbs/yr) to Impaired Waters Under the Regulatory Options (Percent Reduction) [a]				
			Option A	Option B	Option C	Option D	Option E
Mercury-Impaired Receiving Waters							
21	Mercury	123	52.3 (42%)	52.6 (43%)	100 (81%)	123 (99%)	123 (>99%)
Metals (Not Mercury)-Impaired Receiving Waters							
24	Arsenic	4,020	2,660 (66%)	2,660 (66%)	3,540 (88%)	3,830 (95%)	3,880 (96%)
	Boron	4,420,000	312,000 (7%)	312,000 (7%)	344,000 (8%)	353,000 (8%)	353,000 (8%)
	Cadmium	1,810	1,360 (75%)	1,360 (75%)	1,630 (90%)	1,710 (94%)	1,720 (95%)
	Chromium VI	25.6	22.0 (86%)	22.0 (86%)	25.5 (>99%)	25.6 (>99%)	25.6 (>99%)
	Copper	4,150	2,410 (58%)	2,410 (58%)	3,690 (89%)	4,060 (98%)	4,060 (98%)
	Lead	2,500	1,300 (52%)	1,300 (52%)	2,170 (87%)	2,440 (98%)	2,440 (98%)
	Manganese	1,030,000	718,000 (70%)	718,000 (70%)	778,000 (76%)	800,000 (78%)	800,000 (78%)
	Nickel	14,700	9,210 (62%)	9,250 (63%)	13,200 (89%)	14,500 (99%)	14,600 (99%)
	Selenium	20,000	3,250 (16%)	19,100 (95%)	19,500 (98%)	19,700 (98%)	19,700 (98%)
	Thallium	6,620	1,190 (18%)	1,190 (18%)	5,070 (77%)	6,450 (97%)	6,450 (97%)
	Zinc	23,600	18,400 (78%)	18,400 (78%)	21,700 (92%)	22,800 (96%)	23,100 (98%)

Table I-31. Pollutant Removals to Impaired Waters by Impairment Type

Impairment Type/Number of Receiving Waters [b]	Pollutant	Baseline Loadings (lbs/yr)	Pollutant Removals (lbs/yr) to Impaired Waters Under the Regulatory Options (Percent Reduction) [a]				
			Option A	Option B	Option C	Option D	Option E
Nutrient-Impaired Receiving Waters							
15	Total Nitrogen	242,000	0 (0%)	158,000 (65%)	212,000 (87%)	241,000 (99%)	241,000 (99%)
	Total Phosphorous	2,870	0 (0%)	0 (0%)	1,520 (53%)	2,330 (81%)	2,330 (81%)
TDS and Chlorides-Impaired Receiving Waters							
2	Chlorides	CBI	CBI	CBI	CBI	CBI	CBI
	TDS	CBI	CBI	CBI	CBI	CBI	CBI

Source: ERG, 2015c.

Acronyms: CBI (Confidential business information); lbs/yr (pounds per year).

Note: Loadings and pollutant removals are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – For the impaired waters proximity analysis, EPA evaluated 172 immediate receiving waters that receive discharges of the evaluated wastestreams.

c – The EPA impaired water database listed 24 immediate receiving waters as impaired based on the “metal, other than mercury” impairment category. Of those 24 immediate receiving waters, 13 receiving waters are also listed as impaired for one or more specific metals (arsenic, cadmium, manganese, selenium, and zinc). One additional immediate receiving water is impaired for boron (but not included in the “metals, other than mercury” impairment category).

d – Total phosphorous and total nitrogen loadings are presented with this impairment category. Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

Table I-32. Pollutant Removals to the Great Lakes Watershed Under the Regulatory Options

Pollutant	Baseline Loadings to the Great Lakes Watershed (lbs/yr)	Pollutant Removals (lbs/yr) to Great Lakes Watershed Under the Regulatory Options (Percent Reduction) [a]				
		Option A	Option B	Option C	Option D	Option E
Arsenic	1,030	46.7 (5%)	46.7 (5%)	509 (49%)	955 (92%)	1,000 (97%)
Boron	760,000	1,380 (<1%)	1,380 (<1%)	14,700 (2%)	27,300 (4%)	27,300 (4%)
Cadmium	286	6.03 (2%)	6.03 (2%)	134 (47%)	257 (90%)	266 (93%)
Chromium VI	0.548	0.471 (86%)	0.471 (86%)	0.548 (>99%)	0.548 (>99%)	0.548 (>99%)
Copper	1,170	26.6 (2%)	26.6 (2%)	596 (51%)	1,140 (98%)	1,150 (98%)
Lead	869	18.8 (2%)	18.8 (2%)	446 (51%)	856 (99%)	856 (99%)
Manganese	112,000	47.3 (<1%)	47.3 (<1%)	34,700 (31%)	68,300 (61%)	68,300 (61%)
Mercury	37.5	1.20 (3%)	1.48 (4%)	19.1 (51%)	35.7 (95%)	37.1 (99%)
Nickel	4,310	20.6 (<1%)	29.3 (1%)	2,150 (50%)	4,210 (98%)	4,260 (99%)
Selenium	3,540	20.9 (1%)	2,890 (82%)	3,120 (88%)	3,350 (95%)	3,350 (95%)
Thallium	4,320	21.8 (1%)	21.8 (1%)	2,190 (51%)	4,280 (99%)	4,280 (99%)
Zinc	3,860	55.5 (1%)	55.5 (1%)	1,790 (46%)	3,470 (90%)	3,760 (97%)
Nitrogen, total [b]	646,000	2,420 (<1%)	299,000 (46%)	474,000 (73%)	643,000 (>99%)	643,000 (>99%)
Phosphorus, total	10,900	135 (1%)	135 (1%)	5,080 (47%)	9,850 (91%)	9,850 (91%)
Chlorides	24,100,000	11,400 (<1%)	11,400 (<1%)	693,000 (3%)	1,350,000 (6%)	1,350,000 (6%)
TDS	116,000,000	187,000 (<1%)	187,000 (<1%)	18,400,000 (16%)	36,100,000 (31%)	36,100,000 (31%)

Source: ERG, 2015a; ERG, 2015c.

Acronyms: lbs/yr (pounds per year); TDS (total dissolved solids).

Note: Loadings and pollutant removals are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – Total nitrogen loadings are the sum of total Kjeldahl nitrogen and nitrate/nitrite as N loadings.

Table I-33. Key Environmental Improvements for Downstream Waters Under the Regulatory Options

Evaluation Criteria	Number of River-Miles Exceeding Criteria Under Baseline Conditions	Number of River-Miles Exceeding Criteria (Percent Reduction from Baseline Conditions) Under the Regulatory Options [a]				
		Option A	Option B	Option C	Option D	Option E
Water Quality Results						
Freshwater Acute NRWQC	412	395 (4%)	395 (4%)	393 (5%)	388 (6%)	388 (6%)
Freshwater Chronic NRWQC	605	592 (2%)	560 (8%)	542 (10%)	514 (15%)	514 (15%)
Human Health Water and Organism NRWQC	4,050	3,390 (16%)	3,390 (16%)	2,480 (39%)	1,930 (52%)	1,710 (58%)
Human Health Organism-only NRWQC	1,500	1,230 (18%)	1,230 (18%)	1,030 (31%)	781 (48%)	713 (52%)
Drinking Water MCL	751	725 (3%)	720 (4%)	629 (16%)	487 (35%)	487 (35%)
Wildlife Results						
Fish Ingestion NEHC for Minks	1,070	893 (17%)	862 (19%)	720 (33%)	524 (51%)	503 (53%)
Fish Ingestion NEHC for Eagles	1,870	1,580 (15%)	1,560 (16%)	1,260 (32%)	957 (49%)	899 (52%)
Human Health Results—Non-Cancer						
Non-cancer reference dose for child (recreational)	5,800	4,380 (24%)	4,380 (25%)	2,890 (50%)	2,250 (61%)	2,080 (64%)
Non-cancer reference dose for adult (recreational)	3,420	2,830 (17%)	2,820 (17%)	1,960 (43%)	1,430 (58%)	1,350 (61%)
Non-cancer reference dose for child (subsistence)	9,240	7,790 (16%)	7,760 (16%)	5,520 (40%)	4,490 (51%)	4,080 (56%)
Non-cancer reference dose for adult (subsistence)	6,540	5,050 (23%)	5,050 (23%)	3,330 (49%)	2,620 (60%)	2,410 (63%)

Table I-33. Key Environmental Improvements for Downstream Waters Under the Regulatory Options

Evaluation Criteria	Number of River-Miles Exceeding Criteria Under Baseline Conditions	Number of River-Miles Exceeding Criteria (Percent Reduction from Baseline Conditions) Under the Regulatory Options [a]				
		Option A	Option B	Option C	Option D	Option E
Human Health Results—Cancer						
Cancer risk for child (recreational)	227	216 (5%)	216 (5%)	211 (7%)	210 (8%)	207 (9%)
Cancer risk for adult (recreational)	286	263 (8%)	263 (8%)	251 (12%)	246 (14%)	245 (14%)
Cancer risk for child (subsistence)	262	241 (8%)	241 (8%)	239 (9%)	235 (10%)	231 (12%)
Cancer risk for adult (subsistence)	414	375 (9%)	375 (9%)	355 (14%)	328 (21%)	304 (26%)

Source: ERG, 2015i; ERG, 2015l.

Note: River miles are rounded to three significant figures.

a – >0 to 15 percent reduction; 16 to 30 percent reduction; 31 to 45 percent reduction; 46 to 60 percent reduction; >60 percent reduction.

b – EPA evaluated a total of 72,100 river-miles in the downstream receiving water analysis for toxic, bioaccumulative pollutants. Downstream receiving water concentrations are calculated until one of three conditions occurs: 1) the discharge travels 300 kilometers (km) downstream; 2) the discharge travels downstream for a week; or 3) the concentration reaches 1 x 10^{-9} milligrams per liter (mg/L).

APPENDIX J
EA LOADINGS AND TDD LOADINGS: SENSITIVITY ANALYSIS

As discussed in Section 3, the analyses presented in the environmental assessment (EA) report are based on loadings datasets that differ from those that are summarized in the *Technical Development Document for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (TDD),* Document No. EPA-821-R-15-007. This appendix presents a sensitivity analysis that evaluates the difference between the two pollutant loadings datasets (the "EA loadings" and the "TDD loadings") and estimates the change in counts of environmental exceedances that would have resulted from use of the TDD loadings dataset. The analyses in this section reflect changes in the industry that may occur as a result of the Clean Power Plan [Clean Air Act Section 111(d)] (CPP).

Table J-1 quantifies the difference in baseline loadings between the EA loadings and TDD loadings for each of the ten pollutants that are modeled in the EA analyses.

<u>Impacts to Exceedances across All Pollutants</u>

To estimate the influence that using the TDD loadings would have on the overall counts of exceedances identified in the EA Report, EPA took the following steps:

1. EPA determined how many immediate receiving waters had exceedances that were due, in part or in whole, to selenium, thallium, or chromium VI. Because the EA loadings for these pollutants are equal to (or, in the case of selenium, slightly greater than) the corresponding TDD loadings, each immediate receiving water in this group would have had exceedances if EPA had used the TDD loadings.
2. Of the remaining receiving waters with exceedances, EPA determined how many had exceedances that were due, in part or in whole, to arsenic (whose loadings are 9.4 percent lower using the TDD loadings). By assuming that the difference in loadings would result in an equal change in the count of exceedances, EPA assumed that use of the TDD loadings would have resulted in 9.4 percent fewer exceedances among this group of immediate receiving waters.
3. Of the remaining receiving waters with exceedances, EPA determined how many had exceedances that were due, in part or in whole, to zinc (whose loadings are 14 percent lower in the TDD loadings). By assuming that the difference in loadings would result in an equal change in the count of exceedances, EPA assumed that use of the TDD loadings would have resulted in 14 percent fewer exceedances among this group of immediate receiving waters.
4. EPA repeated this process for the remaining modeled pollutants (in order of increasing change between the EA loadings and TDD loadings) until all immediate receiving waters with exceedances were taken into account.

Table J-2 presents the results of this analysis, which demonstrates that use of the TDD loadings in place of the EA loadings would have only minimal effect on the overall counts of

exceedances identified by the immediate receiving water (IRW) model. The benchmark exceedances that would be most affected by use of the TDD loadings are exceedances of chemical stressor concentration limits (CSCLs) for sediment biota. Exceedances of this benchmark under baseline conditions would be approximately 4 percentage points lower (41 percent versus 45 percent) based on use of the TDD loadings instead of the EA loadings. All other benchmark exceedances change by 2 percentage points or less.

This analysis assumes a linear relationship between a loadings reduction and a change in exceedances for that pollutant. As discussed below, however, this assumption likely overestimates the effect of a loadings change on the count of exceedances.

<u>Impacts to Individual Pollutant Exceedances</u>

Table I-22 in Appendix I presents the industry-wide pollutant-specific removals under the regulatory options (reflecting changes in the industry as a result of the CPP). Table I-25 through Table I-30 present the pollutant-specific environmental improvements under the regulatory options. A comparison of the values in these tables indicates that an industry-wide pollutant loading reduction of *x* under the regulatory options usually results in a reduction in benchmark exceedances of *less than x*. For example, looking at Option A:

- *Cadmium*: Loadings reduced by 72 percent; exceedances reduced by approximately 19 to 43 percent.
- *Mercury*: Loadings reduced by 62 percent; exceedances reduced by approximately 7 to 14 percent.
- *Arsenic*: Loadings reduced by 56 percent; exceedances reduced by approximately 4 to 33 percent.
- *Selenium*: Loadings reduced by 21 percent; exceedances reduced by approximately 3 to 19 percent.
- *Thallium*: Loadings reduced by 13 percent; exceedances reduced by approximately 0 to 9 percent.

This suggests that the use of the TDD loadings instead of the EA loadings would have a less-than-linear effect on the number of exceedances in the EA for each pollutant. Based on this observation, EPA estimates that use of the TDD loadings would result in the following approximate effects in the baseline counts of pollutant-specific exceedances identified using the EA loadings:

- *Selenium, thallium, and chromium VI*: No decrease in exceedances.
- *Arsenic, zinc, mercury*: Approximately 10 percent fewer exceedances.
- *Cadmium, copper, and nickel*: Approximately 20 percent fewer exceedances.
- *Lead*: Approximately 25 percent fewer exceedances.

Table J-1. Comparison of Annual Baseline Pollutant Discharges from Steam Electric Power Plants (Evaluated Wastestreams), EA Loadings versus TDD Loadings

Pollutant	Baseline Loadings			Option D Removals			Option D Removals		
	EA Version (lbs/yr)	TDD Version (lbs/yr)	Percent Change	EA Version (lbs/yr)	TDD Version (lbs/yr)	Percent Change	EA Version (%)	TDD Version (%)	Percent Change
Arsenic	22,200	20,100	-9.4%	20,700	18,700	-10%	93%	93%	-0.73%
Cadmium	10,900	8,290	-24%	10,300	7,660	-26%	94%	92%	-1.9%
Chromium (VI)	119	119	0%	119	119	0%	100%	100%	0%
Copper	24,000	16,400	-32%	23,400	15,800	-33%	98%	97%	-1.1%
Lead	14,600	7,670	-47%	14,200	7,340	-48%	98%	96%	-2.0%
Mercury	1,180	992	-16%	1,150	961	-16%	97%	97%	-0.47%
Nickel	94,200	61,900	-34%	92,400	60,200	-35%	98%	97%	-0.87%
Selenium	113,000	115,000	1.4%	110,000	111,000	1.4%	97%	97%	0.032%
Thallium	43,900	43,900	0%	42,800	42,800	0.0%	98%	98%	-0.020%
Zinc	145,000	124,000	-14%	138,000	117,000	-15%	95%	95%	-0.79%

Source: ERG, 2015o.

Note: Loadings and pollutant removals are rounded to three significant figures. Percentages are rounded to two significant figures.

Table J-2. Comparison of Modeled Baseline Exceedances (Using EA Loadings) and Approximated Baseline Exceedances (Using TDD Loadings)

Evaluation Benchmark	Baseline Exceedances in Appendix I (EA Loadings Version)		Baseline Approximated Exceedances (TDD Loadings Version)	
	Number [a]	Percentage	Number [a]	Percentage
Freshwater Acute NRWQC	7	4%	5.85	4%
Freshwater Chronic NRWQC	28	17%	27.8	17%
Human Health Water and Organism NRWQC	73	45%	69.8	43%
Human Health Organism Only NRWQC	51	31%	49.5	30%
Drinking Water MCL	29	18%	29.0	18%
Fish Ingestion NEHC for Minks	46	28%	44.0	27%
Fish Ingestion NEHC for Eagles	56	34%	52.4	32%
CSCLs for Sediment Biota	40	25%	34.2	21%
Negative Reproductive Effects in Fish from Selenium [b]	21	13%	21.0	13%
Negative Reproductive Effects in Mallards from Selenium [b]	25	15%	25.0	15%
Non-Cancer Reference Dose for Child (recreational)	75	46%	72.7	45%
Non-Cancer Reference Dose for Adult (recreational)	67	41%	64.2	39%
Non-Cancer Reference Dose for Child (subsistence)	90	55%	87.8	54%
Non-Cancer Reference Dose for Adult (subsistence)	78	48%	75.7	46%

Source: ERG, 2015o.

Acronyms: CSCL (Chemical stressor concentration limit); MCL (Maximum contaminant level); NEHC (No Effect Hazard Concentration); NRWQC (National Recommended Water Quality Criteria).

a – The alternate scenario analysis encompasses a total of 172 immediate receiving waters and loadings from 148 steam electric power plants (some of which discharge to multiple receiving waters). The IRW model, which excludes the Great Lakes and estuaries, encompasses a total of 163 immediate receiving waters and loadings from 143 steam electric power plants.

b – These rows indicate the number of immediate receiving waters whose median modeled egg/ovary concentration is predicted to result in reproductive impacts among at least 10 percent of the exposed fish or mallard population, as determined using the ecological risk model.

United States Environmental Protection Agency
Office of Water
EPA 821-F-15-004
September 2015

Final Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Industry

Summary

EPA finalized a rule, on September 30, 2015, that revises and strengthens the technology-based effluent limitations guidelines and standards for discharges from steam electric power plants. The final rule sets the first federal limits on the amount of toxic metals and other harmful pollutants that steam electric power plants are allowed to discharge in several of their largest sources of wastewater, based on technology improvements in the steam electric power industry over the last three decades.

- On an annual basis, the rule is projected to reduce the amount of toxic metals, nutrients, and other pollutants that steam electric power plants are allowed to discharge by 1.4 billion pounds and reduce water withdrawal by 57 billion gallons.
- Estimated annual compliance costs for the final rule are $480 million.
- Estimated benefits associated with the rule are $451 to $566 million.

Background

Steam electric power plants discharge large volumes of wastewater, containing vast quantities of pollutants, into waters of the United States. The pollutants include both toxic and bioaccumulative pollutants such as arsenic, lead, mercury, selenium, chromium, and cadmium. Today, these discharges account for about 30 percent of all toxic pollutants discharged into surface waters by all industrial categories regulated under the Clean Water Act. The electric power industry has made great strides to reduce air pollutant emissions under Clean Air Act programs. Yet many of these pollutants are transferred to the wastewater as plants employ technologies to reduce air pollution.

The pollutants discharged by this industry can cause severe health and environmental problems in the form of cancer and non-cancer risks in humans, lowered IQ among children, and deformities and reproductive harm in fish and wildlife. Many of these pollutants, once in the environment, remain there for years. Due to their close proximity to these discharges and relatively high consumption of fish, some minority and low-income communities have greater exposure to, and are therefore at greater risk from, pollutants in steam electric power plant discharges.

There are, however, affordable technologies that are widely available, and already in place at some plants, which are capable of reducing or eliminating steam electric power plant discharges. In the several decades since the steam electric ELGs were last revised, such technologies have increasingly been used at plants. This final rule is the first to ensure that plants in the steam electric industry employ technologies designed to reduce discharges of toxic metals and other harmful pollutants discharged in the plants' largest sources of wastewater.

Who is affected by this regulation?

Certain coal-fired steam electric power plants will be affected by this rule. EPA estimates that about 12 percent of steam electric power plants will have to make new investments to meet the new requirements of this rule.

What does this rule require?

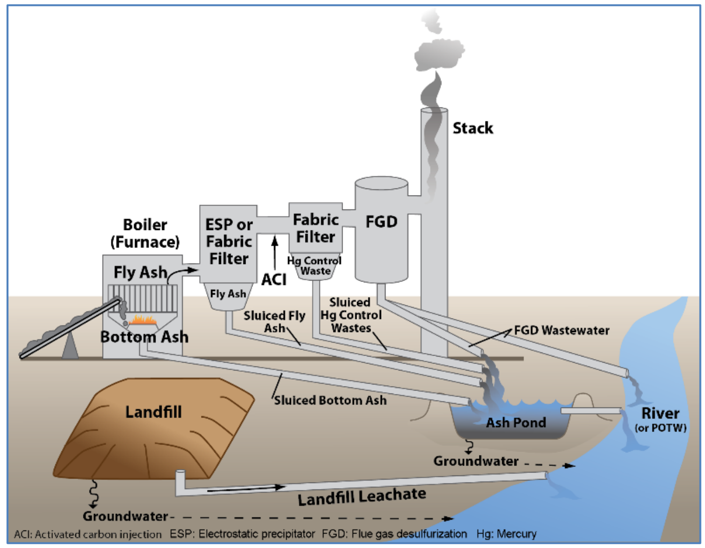
Generally, the final rule establishes new requirements for wastewater streams from the following processes and byproducts associated with steam electric power generation: flue gas desulfurization, fly ash, bottom ash, flue gas mercury control, and gasification of fuels such as coal and petroleum coke.

The final rule phases in the new, more stringent requirements in the form of effluent limits for arsenic, mercury, selenium, and nitrogen for wastewater discharged from wet scrubber systems (flue gas desulfurization wastestream) and zero discharge of pollutants in ash transport water that must be incorporated into the plants' NPDES permits.

The rule encourages plants to commit to meeting even more stringent limits for pollutants in the flue gas desulfurization wastewater, plus a limit on total dissolved solids, based on evaporation technology, by giving them until the end of 2023 to meet the more stringent limits.

The rule also establishes zero discharge pollutant limits for flue gas mercury control wastewater, and stringent limits on arsenic, mercury, selenium and total dissolved solids in coal gasification wastewater, based on evaporation technology.

The rule also includes even more stringent controls for any new coal or petroleum coke plants that may be built in the future.



How much time does a steam electric power plant have before implementation?

Each plant must comply between 2018 and 2023 depending on when it needs a new Clean Water Act permit.

What are the benefits of this regulation?

There are numerous documented instances of environmental impacts associated with steam electric power plant discharges including widespread aquatic life impacts and toxic metal bioaccumulation in wildlife. In addition, there are increased cancer and non-cancer risks to humans from the pollutants. This regulation will greatly reduce these impacts. Of the benefits that could be monetized, EPA projects \$451 to \$566 million per year in benefits associated with this rule.

What are the costs of implementing this rule?

Compliance costs of the final rule are economically achievable, with an annual estimated cost of \$480 million per year.

Analysis shows that the rule will have minimal impacts on electricity prices and the amount of electricity generating capacity.

Where can I find more information?

For technical information about this rule, please contact Ronald Jordan by email at Jordan.ronald@epa.gov or by telephone at 202-566-1003. For economic information about this rule, please contact James Covington by email at Covington.james@epa.gov or by phone at 202-566-1034. You can also learn more about this rule by visiting EPA's website at: http://www2.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule

HUNTON & WILLIAMS

HUNTON & WILLIAMS LLP
RIVERFRONT PLAZA, EAST TOWER
951 EAST BYRD STREET
RICHMOND, VIRGINIA 23219-4074

TEL 804 • 788 • 8200
FAX 804 • 788 • 8218

HARRY M. ("PETE") JOHNSON III
DIRECT DIAL: 804 • 788 • 8784
EMAIL: pjohnson@hunton.com

FILE NO: 29142.080072

March 24, 2017

By U.S. Mail and E-mail

Docket No. EPA-HQ-OW-2009-0819

Mr. Scott Pruitt, Administrator
Environmental Protection Agency
William Jefferson Clinton Building
1200 Pennsylvania Avenue, N. W.
Mail Code: 1101A
Washington, DC 20460

Re: **Utility Water Act Group Petition for Reconsideration of EPA's "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category; Final Rule," 80 Fed. Reg. 67,838 (Nov. 3, 2015)**

Dear Administrator Pruitt:

Enclosed please find the Utility Water Act Group's Petition for Reconsideration of EPA's final rule titled "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category," 80 Fed. Reg. 67,838 (Nov. 3, 2015). A copy of this petition has also been electronically mailed to the Office of Water Docket Center for filing in Docket No. EPA-HQ-OW-2009-0819.

Please contact me if you have any questions about the Petition.

Sincerely,

Pete Johnson / whp

Harry M. ("Pete") Johnson III

Enclosure

cc by hand delivery and e-mail:
Mr. Michael H. Shapiro

Cc by e-mail:
Jessica O'Donnell, Esq.
Kevin S. Minoli, Esq.
EPA Docket Center

In the United States Environmental Protection Agency

Utility Water Act Group's Petition for Rulemaking to Reconsider and Administratively Stay the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category; Final Rule, 80 Fed. Reg. 67,838-903 (Nov. 3, 2015)

Kristy A. N. Bulleit
Hunton & Williams LLP
2200 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-1709
202-955-1547 (tel.)
kbulleit@hunton.com

Harry M. Johnson, III
Elizabeth E. Aldridge
Hunton & Williams LLP
Riverfront Plaza, East Tower
951 East Byrd Street
Richmond, VA 23219-4074
804-788-8784 (tel.)
pjohnson@hunton.com
ealdridge@hunton.com

Counsel for Petitioner Utility Water Act Group

TABLE OF CONTENTS

RELIEF SOUGHT

The Utility Water Act Group[1] ("UWAG") hereby petitions the United States Environmental Protection Agency ("EPA") pursuant to 5 U.S.C. § 553(e) for a rulemaking to reconsider the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category; Final Rule (the "ELG Rule," the "Final Rule," or "Rule").[2] UWAG also seeks an administrative stay of the Rule pursuant to 5 U.S.C. § 705 because the Rule is currently in litigation[3] and "justice so requires."[4] Furthermore, the EPA should take all other administrative

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[1] UWAG is a voluntary, *ad hoc*, non-profit, unincorporated group of 163 individual energy companies and three national trade associations of energy companies: the Edison Electric Institute, the National Rural Electric Cooperative Association, and the American Public Power Association. The individual energy companies operate power plants and other facilities that generate, transmit, and distribute electricity to residential, commercial, industrial, and institutional customers. The Edison Electric Institute is the association of U.S. shareholder-owned energy companies, international affiliates, and industry associates. EEI members serve 220 million Americans in all 50 states, approximately 70 percent of all retail electricity customers in the country. The National Rural Electric Cooperative Association is the association of not-for-profit energy cooperatives supplying central station service through generation, transmission, and distribution of electricity to rural areas of the United States. The American Public Power Association is the national service organization for the more than 2,000 not-for-profit, community-owned electric utilities in the U.S. APPA member utilities serve more than 48 million Americans in 49 states (all but Hawaii), representing 16 percent of the market. UWAG's purpose is to participate on behalf of its members in EPA's rulemakings under the Clean Water Act and in litigation arising from those rulemakings.

[2] Section 553(e) provides that interested persons have "the right to petition for the issuance, amendment, or repeal of a rule."

[3] *Southwestern Elec. Power Co. v. EPA*, et al, No. 15-60821(L) (5th Cir.) (consolidating seven separate Petitions for Review) ("ELG Litigation").

[4] The administrative stay under 5 U.S.C. § 705 should postpone all deadlines in the Rule. The length of the stay should be calculated based on the number of days between the date that the first Petition for Review was filed in a federal court of appeals (November 19, 2015) and the later of the conclusion of judicial review or any further rulemaking undertaken as a result of that litigation or reconsideration undertaken in response to this Petition.

actions that may be necessary to assure the immediate suspension or delay of the Rule's fast-approaching compliance deadlines while EPA works to reconsider and revise, as appropriate, the substantive requirements of the current Rule pursuant to notice and comment rulemaking.

INTRODUCTION

I. Overview of Reasons to Reconsider the Rule

UWAG petitions EPA to reconsider the Rule to address its numerous flaws. Some of those flaws are explained in detail in the pending ELG Litigation and others are demonstrated by new information and circumstances described in this petition. The Rule – which is the product of a settlement between environmental groups and EPA – is inconsistent with the President's regulatory reform agenda reflected in recent Executive Orders.

The Rule affects both the utility and coal industries and also affects the large and small businesses that support and rely upon those industries. It will cause negative impacts on jobs due to the excessive costs of compliance – which were grossly underestimated by EPA – and regulatory burdens forcing plant closures. Those impacts are being, and will be, felt in communities around the country where those industries operate. Reconsideration will enable the Agency to take all of these impacts into account to the full extent allowed by law, as contemplated by recent Executive Orders.

The cost issues are exacerbated by EPA's overly ambitious assumptions about facilities' ability to comply with the limits imposed in the Rule. In fact, in many instances, facilities are not able to meet the limits with the technologies that EPA identified as the "best available technology economically achievable" ("BAT"). Actual costs are, therefore, much higher than EPA predicted. Either plants cannot comply at all or they are being forced to design, test, and try unproven technologies in addition to, or in lieu of, the model technologies in the hope of developing a compliance strategy. The Rule should be reconsidered so that its true costs can be accounted for, as required by the Clean Water Act ("CWA").

It is also undisputed that the Rule fails to consider fully the cumulative impacts of the Rule and the other contemporaneous major rulemakings affecting these industries. The cumulative cost of all of those rules affecting the utility and coal industries is staggering. In addition to the issue of costs, the respective rules' compliance deadlines were not harmonized to minimize or eliminate their conflicts. In the ELG rulemaking, EPA did not take public comment on the impacts of all of the rules combined. Undoubtedly, the industry's views could have been – and can be – informative. Consistent with the Administration's regulatory reform agenda, reconsideration of the ELG Rule will allow EPA to

consider all of these major rules collectively – and not through a piecemeal approach – with the benefit of public input.[5]

In addition, the Rule violated fundamental principles of public participation in rulemakings – transparency and reproducibility. Never before has EPA promulgated a rule while shielding such vast amounts of its basic work product from review. Here, EPA invoked the concept of Confidential Business Information ("CBI") to withhold facts, methods, and analyses on which its conclusions depend. To an unprecedented extent, the Agency withheld fundamental information purporting to justify the Rule. Among the information claimed as CBI, EPA designated as CBI thousands of pages of the record that demonstrably were not entitled to confidential treatment.

Compounding the lack of transparency and reproducibility, EPA repeatedly responded to public comments by citing key information that the Agency withheld from the public record. Directing commenters to information that is unavailable is effectively no response at all. Reconsideration will allow EPA to fix these problems.

[5] Moreover, since promulgation of the ELG Rule, circumstances have changed for the Clean Power Plan ("CPP") and the Coal Combustion Residuals ("CCR") Rule. Now, it is unclear the extent to which the CPP Rule will take effect or what changes to the CCR Rule will be made since portions of it are the subject of a new rulemaking. These significant changes in circumstances alone warrant reconsideration of the ELG Rule.

EPA also promulgated the Rule without gathering necessary data on certain types of plants covered by the Rule. EPA gathered no data whatsoever on the treatability of selenium and nitrates in Flue Gas Desulfurization Wastewater ("FGDW") produced by plants burning subbituminous coals, such as Powder River Basin ("PRB") coal, or lignite. These plants comprise upwards of 25% of the industry. Likewise, EPA set limits for modern Integrated Gasification Combined-Cycle ("IGCC") plants without gathering data relevant to those plants. Lacking data or any other credible evaluation of the likely performance and cost, EPA had no reasonable basis for concluding that those plants can comply with the limits imposed by the Rule. The Rule should be re-opened and reconsidered so that the applicable limits can be based on appropriate data.

Actual experience is confirming that the FGD limits cannot be met at all facilities. A recent pilot study using the biological treatment technology EPA selected as BAT has been conducted at a PRB-burning plant, and indications are that the data show the selenium limits cannot be met. Other facilities are finding that technologies beyond those considered by EPA may be necessary to meet the FGD limits. Similarly, data from a state-of-the-art IGCC plant prove that it cannot meet the Rule's wastewater limits.

Finally, EPA used patently obsolete or otherwise unreliable data in its analyses supporting its "zero discharge" requirement for bottom ash transport

water ("BATW"). In violation of both the letter and spirit of the Data Quality Act[6] and its implementing regulations, EPA evaluated BATW with poor quality characterization data, some of which was decades old. EPA used the data for several important purposes, including calculating a cost-effectiveness ratio that allows the Agency to compare the ELG Rule to other effluent guidelines rules. Obviously, if the underlying BATW characterization data are flawed, then the cost-effectiveness analysis is also flawed. Although EPA insisted a cost-effectiveness analysis is not required by the CWA, the Agency generated these analyses for all recent effluent guidelines rules, and it had an obligation to base its analysis on acceptable data. This it did not do.

All of these issues, both together and individually, warrant reconsideration of the ELG Rule to promote the President's regulatory reform agenda.

II. The Policies Established by Executive Orders on Regulatory Reform

The President has established an agenda mandating regulatory reform.[7] Reconsideration of the Rule is essential to fulfill the policies expressed in the Regulatory Reform Order.

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[6] Pub. L. 106-554, § 1(a)(3), Title V, § 515 (Dec. 21, 2000) (also sometimes known as "Information Quality Act").

[7] *See* Executive Order 13777, *Enforcing the Regulatory Reform Agenda* (Feb. 24, 2017), 82 Fed. Reg. 12,285 (Mar. 1, 2017) ("Regulatory Reform Order").

The Regulatory Reform Order directs agencies to create Task Forces to "evaluate existing regulations … and make recommendations to the agency head regarding their repeal, replacement, or modification, consistent with applicable law."[8] The Task Forces have until May 25, 2017, to make their recommendations.[9] The Rule should be chief among the EPA Task Force's recommendations, for all the reasons set forth in this Petition.

The Task Forces are charged *at a minimum* with identifying regulations that adversely affect jobs, that impose costs exceeding benefits, or that rely on information and methods that are not transparent and reproducible.[10] The Rule

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[8] *Id.* at 12,286.

[9] By imposing a rigorous deadline on the Task Force, the Regulatory Reform Order recognizes the urgency of addressing overly burdensome regulations. Ultimately, it is the customers of the electric utility industry who suffer the economic burden of exorbitantly expensive rules. This burden is exacerbated when important issues regarding those rules go unresolved for extended periods of time (*e.g.*, the Mercury and Air Toxics rule). Uncertainty also contributes to potential instability in energy delivery. Thus, in the spirit of the Regulatory Reform Order, the Agency should move expeditiously to reconsider and revise the Rule while suspending its deadlines in the meanwhile.

[10] *Id.* § 3(d). The Order reads: "At a minimum, each Regulatory Reform Task Force shall attempt to identify regulations that:

> (i) eliminate jobs, or inhibit job creation; …
>
> (iii) impose costs that exceed benefits; … [or]
>
> (v) are inconsistent with the requirements of section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note), or the guidance issued pursuant to that provision, in particular those regulations that rely in whole or in part on data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility;..."

here meets *all three* of these criteria, as explained in more detail in the body of this Petition.[11]

Moreover, this Petition for Reconsideration satisfies another mandatory element of the Regulatory Reform Order – consultation with "entities significantly affected" by the Rule.[12] The Order directs that the Task Forces "shall seek input and other assistance" from stakeholders in identifying regulations with adverse effects:

> In performing the evaluation described in subsection (d) of this section, each Regulatory Reform Task Force shall seek input and other assistance, as permitted by law, from entities significantly affected by Federal regulations, including State, local, and tribal governments, small businesses, consumers, non-governmental organizations, and trade associations.[13]

Finally, the Regulatory Reform Order also incorporates fundamental principles from earlier Executive Orders that likewise support reconsideration of the Rule. For instance, agencies must consider the cumulative costs of regulations on businesses and communities:

> Each agency shall tailor its regulations to impose the least burden on society, including individuals, businesses of differing sizes, and other

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[11] As to the second criterion (costs exceeding benefits), EPA's cost-benefit analysis was based so heavily on flawed or unavailable data that a full evaluation of the Rule's true costs and benefits is effectively impossible based on the current record. Thus, a primary focus on reconsideration should be to develop a record that will allow the Agency to determine whether the benefits indeed outweigh the costs of a new rule.

[12] *Id.* § 3(e).

[13] *Id.*

> entities (including small communities and governmental entities), consistent with obtaining the regulatory objectives, *taking into account, among other things, and to the extent practicable, the costs of cumulative regulations*.[14]

As detailed later in this Petition, the Rule fails to consider accurately the cumulative costs of EPA's major rules affecting the utility industry, the coal industry, and the communities depending on them.

In addition to the Regulatory Reform Order, the Rule also should be reconsidered as part of the Agency's compliance with the Executive Order 13771, popularly known as the "Two-for-One Order."[15] In addition to its other directives, the Two-for-One Order requires agencies to achieve a net incremental regulatory cost of zero in Fiscal 2017.[16] The costs of new regulations during the current fiscal year are offset by costs eliminated from existing regulations: "incremental costs associated with new regulations shall, to the extent permitted by law, be offset by the elimination of existing costs associated with at least two prior regulations."[17]

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[14] Executive Order 12866, *Regulatory Planning and Review* § 1(b)(11) (Sept. 30, 1993), 58 Fed. Reg. 51,735, 51,736 (Oct. 4, 1993) (emphasis added) (incorporated by reference in Regulatory Reform Order § 2(a)(ii)).

[15] *Executive Order 13771, Reducing Regulation and Controlling Regulatory Costs* (Jan. 30, 2017), 82 Fed. Reg. 9339 (Feb. 3, 2017).

[16] "For fiscal year 2017, which is in progress, the heads of all agencies are directed that the total incremental cost of all new regulations, including repealed regulations, to be finalized this year shall be no greater than zero,..." *Id.* § 2(b).

[17] *Id.* § 2(c).

By reconsidering the Rule and taking its costs properly into account when promulgating a revised ELG rule, EPA can discharge this obligation.

In carrying out its duties under the Regulatory Reform Order, the Agency must comply with the Administrative Procedure Act ("APA") and other applicable law.[18] Granting this Petition would enable EPA to promote the express policy of the Two-for-One Order consistent with the APA.

BACKGROUND ON RULE AND PENDING ELG LITIGATION

I. The Consent Decree Leading Up to the Final Rule

The ELG Rule is the product of a lawsuit. On September 14, 2009, the EPA Administrator received a 60-day notice of intent from the Environmental Integrity Project, which threatened to sue EPA for not revising the steam electric effluent limitations guidelines ("ELGs"). The very next day, EPA announced plans to revise the guidelines.[19] The next month, EPA released a "final detailed report" on its investigation of the industry for possible ELG revision.[20]

On November 8, 2010, Defenders of Wildlife and Sierra Club sued EPA and asked the court to set a judicial schedule for the rulemaking. But the plaintiffs had

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[18] *Id.*

[19] Press Release, EPA, *EPA Expects to Revise Rules for Wastewater Discharges from Power Plants* (Sept. 15, 2009).

[20] EPA, *Steam Electric Power Generating Point Source Category: Final Detailed Study Report,* EPA-821-R-09-008 (Oct. 2009), EPA-HQ-OW-2009-0819-0004 ("Final Detailed Study").

already settled with EPA. That same day, EPA and the environmental organizations jointly presented a Consent Decree to the court. As part of the settlement, EPA agreed to pay the plaintiffs $40,000 for the costs of negotiating, drafting, and filing the consent decree.[21] Thus, the rulemaking proceeded pursuant to a schedule imposed by a court order agreed to by environmental organizations and EPA without input from the industry and other affected stakeholders. Nonetheless, whenever possible – as during the comment periods on EPA's information collection request for the Rule – the industry urged EPA to collect representative data and provided recommendations for doing so.[22]

[21] UWAG moved to intervene in the litigation, asserting that the district court did not have subject matter jurisdiction over the matter because the CWA by its terms does not require EPA to revise ELGs by a date certain, instead requiring only that the Agency periodically review those guidelines – a duty that the facts pled showed EPA had discharged. The court denied UWAG's motion to intervene. *See Defenders of Wildlife v. Jackson,* 284 F.R.D. 1 (D.D.C. 2012). On appeal, the United States Court of Appeals of the D.C. Circuit found that UWAG lacked standing to challenge the rulemaking negotiated between EPA and environmental groups. *Defenders of Wildlife v. Perciaseppe,* 714 F.3d 1317 (D.C. Cir. 2013).

[22] *See, e.g.,* UWAG Comments on EPA's Draft Data Request (Mar. 23, 2007), EPA-HQ-OW-2009-0819-5450-Att 079 at 6 (commenting that EPA's plan to collect wastewater samples from 5-6 facilities would result in a dataset too small for valid correlations because even two plants burning the same coal and using similar technologies could have different wastewater quality due to factors such as boiler design, coal variations within the same coal rank, and size of treatment equipment or settling pond). *See also* UWAG Comments on Questionnaire for the Steam Electric Power Generating Effluent Guidelines, EPA ICR No. 2368.01 (Apr. 8, 2010), EPA-HQ-OW-2009-0819-0052 at 14-21 (questioning the practical utility of the ICR's focus on CCRs, when the proposed CCR rule was soon to be released and would radically change management of CCRs).

II. Promulgation of the Final Rule

EPA proposed the Rule on June 7, 2013.[23] The public comment period lasted until September 20, 2013. Between the end of the comment period and the promulgation of the Final Rule, EPA promulgated a suite of other major rules directed at coal-fired electric generating units. These included the Cooling Water Intake Structures ("CWIS") rule for existing facilities,[24] the CCR rule,[25] the CPP rule,[26] and the Carbon Pollution Standard for New Power Plants rule ("CPS").[27] EPA estimates the annualized total social costs[28] of the ELG and CWIS rules will be $471.2-479.5 million (2013$) and $274.9 million (2011$), respectively.[29] The Agency estimates the total annualized incremental costs of the CCR rule will be $509-735 million (2013$) (over 100 years).[30] The CPP is in a class by itself, with EPA predicting annual illustrative compliance costs of $1.4-2.5 billion (2020), $1.0-3.0 billion (2025), and $5.1-8.4 billion (2050) (all in 2011$).[31] Many of

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[23] 78 Fed. Reg. 34,432 (June 7, 2013).

[24] 79 Fed. Reg. 48,300 (Aug. 15, 2014).

[25] 80 Fed. Reg. 21,302 (Apr. 17, 2015).

[26] 80 Fed. Reg. 64,662 (Oct. 23, 2015).

[27] 80 Fed. Reg. 64,510 (Oct. 23, 2015).

[28] "Total social costs" includes compliance costs to facilities and government administrative costs.

[29] 80 Fed. Reg. at 67,865 (ELG Rule); 79 Fed. Reg. at 48,415 (CWIS Rule).

[30] 80 Fed. Reg. at 21,309.

[31] 80 Fed. Reg. at 64,680-81.

those costs have been challenged as underestimates. In any event, it must be remembered that, ultimately, these billions in costs will be borne by utilities' ratepayers.

The Final ELG Rule was published on November 3, 2015.[32]

III. The Litigation Challenging the ELG Rule

Various petitioners filed seven petitions for judicial review of the Rule in multiple courts. The petitions were consolidated in the United States Court of Appeals for the Fifth Circuit.[33] Three separate groups of Petitioners (including UWAG as an industry petitioner) filed their opening briefs on December 5, 2016. EPA's brief is due May 4, 2017.[34]

IV. UWAG's Attempts to Obtain a Complete Record from EPA

When it promulgated the Final Rule, EPA improperly designated and withheld numerous documents in whole or in part on grounds of CBI. UWAG tried unsuccessfully to resolve these issues with EPA long before EPA finalized the administrative record and filed the certified index in the ELG Litigation. In a letter dated February 17, 2016, counsel for UWAG and others wrote to counsel for

[32] 80 Fed. Reg. 67,838-903 (Nov. 3, 2015).

[33] Consolidation Order, Judicial Panel on Multidistrict Litigation, ELG Litigation, ECF No. 00513301255 (Dec. 9, 2015).

[34] EPA's brief had been due April 4, 2017. On March 20, 2017, EPA filed a Motion to stay the briefing schedule for 30 days due to DOJ's unexpected reassignment of the case to new counsel. The Court granted the extension on March 21. However, the Rule itself is not stayed during this period. Hence, this Petition seeks an administrative stay of the Rule and/or other action to suspend the Rule's deadlines.

EPA seeking the disclosure of "EPA's methodologies and analyses supporting the ELG Rule that have been improperly withheld as … CBI," and additional "non-CBI information … improperly withheld from the public record."[35] In response, EPA refused to produce any additional information for the public record.[36] In fact, EPA apparently could not find a single *sentence or word* of additional information that could be disclosed despite clear evidence that the broad use of CBI designations was inappropriate.

Because the withheld information was critical to understanding the basis for the Rule, UWAG and others industry members thereafter filed a joint motion to complete the record in the Court of Appeals. The motion asked simply for EPA to reconsider whether the information withheld as CBI in fact qualified as CBI and for EPA to produce its methods and analyses in a non-CBI format for the public and the Court. EPA continued to resist the requests. The motion is still pending and is to be decided by the Court in conjunction with the merits of the appeal.

REASONS TO RECONSIDER THE RULE

I. EPA's Sweeping Use of CBI To Withhold Its Methods and Analyses Violated Principles of Transparency

EPA withheld its most basic data, methodologies, and analyses from the public record under the guise of CBI. This unprecedented lack of openness is

[35] Exhibit 1 at 1.

[36] Exhibit 2.

inconsistent with the policies articulated in Regulatory Reform Order for transparency and reproducibility. EPA has a duty to disclose the information supporting the Rule and to fully explain its course of inquiry, analysis, and reasoning. EPA has at its disposal tools that allow it to protect CBI, if necessary, yet EPA used none of them here, instead withholding at least 1,194 documents in whole or in part.

A. **The Overreliance on CBI Is Inconsistent With the Data Quality Act and Agency Guidelines on Transparency and Reproducibility**

In 2001, Congress enacted Public Law 106-554 ("Data Quality Act") directing OMB to issue guidance for ensuring the quality of data disseminated by Federal agencies by maximizing the objectivity, utility, and integrity of the information collected. OMB responded to the Data Quality Act by issuing guidelines for data quality and directing agencies to issue their own guidelines.[37] In turn, EPA issued its guidelines.[38] The Regulatory Reform Order expressly requires Task Forces to identify regulations that are inconsistent with the Data Quality Act or the guidance issued pursuant to it, "*in particular those regulations that rely in whole or in part on data, information, or methods that are not publicly*

[37] OMB, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies, Republication*, 67 Fed. Reg. 8452 (Feb. 22, 2002) ("OMB Data Quality Guidelines").

[38] EPA, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility and Integrity of Information Disseminated by the Environmental Protection Agency*, EPA/260R-02-008 (Oct. 2002) ("EPA Data Quality Guidelines").

available or that are insufficiently transparent to meet the standard for reproducibility."[39] The Rule meets this definition squarely.

According to the OMB Data Quality Guidelines, agency information must satisfy the "objectivity" criterion of the Data Quality Act, meaning "a focus on ensuring accurate, reliable, and unbiased information."[40] EPA describes the objectivity criterion similarly: "'Objectivity' focuses on whether the disseminated information …, as a matter of substance, is accurate, reliable, and unbiased."[41]

Because the record in a major rulemaking is considered to be an "influential" class of information, EPA expressly recognizes that such information is subject to a heightened standard of quality.[42] This "higher degree of quality" requires even greater "transparency about data and methods" to "facilitate the reproducibility of such information…."[43] Indeed, it is "important that analytic results for influential information have a higher degree of transparency…."[44]

EPA's conclusions in the Rule, as shown below, do not meet the definition of "reproducibility" as a result of the heavy use of CBI:

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[39] Regulatory Reform Order § 3(d)(v), 82 Fed. Reg. at 12,286 (emphasis added).

[40] OMB Data Quality Guidelines at 8459.

[41] EPA Data Quality Guidelines at 15.

[42] *Id.* at 20 ("should adhere to a rigorous standard of quality").

[43] *Id.* at 20-21.

[44] *Id.* at 21.

> "Reproducibility" means that the information is capable of being substantially reproduced, subject to an acceptable degree of imprecision.... With respect to analytic results, "capable of being substantially reproduced" means that independent analysis of the original or supporting data using identical methods would generate similar analytic results, subject to an acceptable degree of imprecision or error.[45]

Likewise, EPA's conclusions in the Rule do not meet its own guidelines for reproducibility:

> In addition, these Guidelines provide for the use of especially rigorous "robustness checks" and documentation of what checks were undertaken. *These steps, along with transparency about the sources of data used, various assumptions employed, analytic methods applied, and statistical procedures employed should assure that analytic results are "capable of being substantially reproduced."*[46]

Protections for CBI do not automatically dispense with the requirements of reproducibility. The OMB Data Quality Guidelines provide for situations where data cannot be released for valid reasons, and the guidelines impose alternative requirements:

> i. Making the data and methods publicly available will assist in determining whether analytic results are reproducible. However, the objectivity standard does not override other compelling interests such as privacy, trade secrets, intellectual property, and other confidentiality protections.
>
> ii. In situations where public access to data and methods will not occur due to other compelling interests, agencies shall apply especially rigorous robustness checks to analytic results and document

[45] OMB Data Quality Guidelines at 8460.

[46] EPA Data Quality Guidelines, Appendix A at 47 (emphasis added).

> what checks were undertaken. *Agency guidelines shall, however, in all cases, require a disclosure of the specific data sources that have been used and the specific quantitative methods and assumptions that have been employed.*[47]

These heightened standards of transparency and reproducibility lay out a clear analytical process for each individual assertion of CBI by EPA. Is the information in fact CBI? If not, EPA must make it available to the public with the Rule. If the information is CBI, then EPA must perform "especially rigorous robustness checks," disclose the sources of information, and disclose the specific quantitative methods and assumptions used.

The record supporting the Rule did not meet the requirements for reproducibility, regardless of whether EPA's individual claims of CBI were valid. In many instances documented below and in the ELG Litigation,[48] the CBI claims were specious on their face. In other instances where the CBI designation may or may not be warranted, there is scant evidence of "robustness checks," documentation of those checks, or other assurances of reproducibility, such as sources of data, various assumptions applied, and analytic methods applied. Thus, the industry and the public have been unable to evaluate the Rule fully.

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[47] OMB Data Quality Guidelines at 8460 (emphasis added). *See also* EPA Data Quality Guidelines at 21 (implementing same).

[48] *See* Industry Petitioners' Joint Motion to Complete the Administrative Record, ELG Litigation (June 22, 2016), ECF No. 00513560826 ("Motion to Complete Record"); Original Brief of Industry Petitioners, ELG Litigation (Dec. 5, 2016), ECF No. 00513783903 at 24-51.

Reconsideration is appropriate to allow meaningful public participation consistent with the policies of the Regulatory Reform Order.

B. EPA Can Make the Relevant Information Available Without Compromising CBI

EPA has available a variety of tools to present facts and analyses on which it relied, while at the same time protecting CBI. It has used those tools in many other effluent guidelines rulemakings.[49] EPA could, for instance, produce ranges of values, graphs, cost formulas or curves, discussions, or other analyses, as appropriate, to satisfy its obligations to present the "whole record" for review, including its methodologies and analyses, without disclosing CBI.[50]

In addition, EPA could have simply taken the time to collect more data that are not CBI. It could have supplemented the CBI information with information from other sources or consultants who would not assert CBI. Likewise, EPA could have conducted or commissioned its own studies to independently verify the information claimed as CBI. Reconsideration would allow this.

[49] *See, e.g.*, EPA, *Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category* (Apr. 2002), at 1-9, 14-3–14-6 (aggregating certain data in the public record and masking facility identities) (available at http://www.epa.gov/eg/iron-and-steel-manufacturing-effluent-guidelines-documents) (last accessed Dec. 2, 2016).

[50] *See NRDC v. Thomas*, 805 F.2d 410, 418 n.13 (D.C. Cir. 1986).

C. EPA Has Not Been Transparent About the Cost or Performance of BAT for FGD Wastewater or Bottom Ash Transport Water

Congress has limited EPA's discretion in the selection of BAT by identifying specific factors the Agency must consider.[51] Because BAT must be "economically achievable," one such factor EPA must consider is cost.[52] The cost of regulations is also a policy priority under the Regulatory Reform Order. The CWA further requires EPA to consider the performance of the technology at reducing pollutants.[53] Performance and cost go hand-in-hand, as improving performance may require adding more technology, which then increases cost. The interplay of cost and performance is also a point of emphasis in the Regulatory Reform Order, which mandates a focus on cost-benefit analyses.

EPA bears the burden of demonstrating that it has considered the cost of the technology it chose as BAT and showing that the technology, at the cost EPA projected, will achieve the performance standards it set. Here, EPA's explanation of its performance and cost estimates for the technologies it chose as BAT for FGDW and BATW were general conclusions with crucial detail missing.

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[51] 33 U.S.C. § 1314(b)(2)(B).

[52] *Id.* ("Factors relating to the assessment of best available technology shall take into account … the cost of achieving such effluent reduction….").

[53] *Id.* at § 1314(b)(2)(A); *see E. I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 131 (1977).

At the proposed rule stage, EPA discussed these technologies and its methodologies and analyses for evaluating their cost. EPA provided significantly more detail about its methodologies when it published the proposed ELG rule for public comment.[54] When EPA then took comments from the public, it learned – and in some instances even acknowledged – that its performance and cost analyses had shortcomings, overstating performance and understating cost.[55] This meant that EPA was required to collect additional information, make changes, and explain the changes in the Final Rule.

Transparency in the Final Rule was even more vital because EPA's errors at proposal were not trivial. For example, comments on the proposed Rule showed that, industry-wide, the cost of installing biological treatment alone for FGDW would nearly exceed EPA's estimated costs for adding both biological treatment and chemical precipitation treatment.[56] Indeed, one company's comments showed that the cost of installing EPA's selected FGDW treatment technology at its plants would be nearly *seven times higher* than EPA had estimated for a subset of those

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[54] *See, e.g.*, Index.2292.6-88–6-105. [This Petition uses the same convention for citations to EPA's administrative record as in the Litigation by referring to the Certified Index. *See* Original Brief of Industry Petitioners at 5 n.11.]

[55] *See, e.g.*, Index.10081.6-665 (EPA agreeing with commenters who indicated that EPA should consider engineering-related costs and construction timelines associated with closed-loop bottom ash handling retrofits).

[56] *See* Index.8939.A-25 (finding incremental biological costs of over $2 billion).

same plants.[57] Similarly, the Electric Power Research Institute ("EPRI")[58] was unable to reproduce EPA's conclusions regarding the ability of biological treatment to remove pollutants from FGDW.[59] Based on EPRI's calculations, EPA had overestimated pollutant removals for biological treatment by a factor of eight.[60]

EPA's cost estimate for achieving no-discharge of BATW was likewise off by a wide margin. For example, after identifying a host of errors and omissions, EPRI calculated total industry capital costs for conversion from wet to dry bottom ash handling, just for plants with a nameplate generating capacity above 400 megawatts, to be over $6 billion and $452 million in annual O&M costs – more than double EPA's estimate.[61]

1. EPA Has Withheld Key Information Showing How the Agency Responded to Criticisms of Its Original Analyses

EPA responded to these comments by soliciting revised information from financially interested vendors. These are the same vendors whose technology was at issue and who had incentives to tout their systems as effective and reasonably

[57] Index.8689.160 (Southern Company).

[58] EPRI is an independent, nonprofit organization that conducts research and development relating to the generation, delivery, and use of electricity.

[59] Index.8939.4-2.

[60] *Id.* at 4-1.

[61] Index.8939.8-2.

priced. Much of the revised information – *and how EPA incorporated it into the final analyses* – was withheld. Thus, the public cannot determine whether EPA in fact corrected the original errors or whether the revised analyses are themselves appropriate. This flies in the face of the APA and the directives of the Regulatory Reform Order.

As Industry Petitioners have described at length, EPA's contacts with vendors demonstrate how EPA consciously chose to conceal the substance of its final cost analysis.[62] EPA prepared follow-up questions for one vendor "to clarify whether specific cost elements [identified by commenters] are included or not included in the cost estimates provided in previous correspondence," among other things.[63] The vendor responded to these questions, but that information has been withheld from the public record.[64]

Notes of subsequent meetings and correspondence between EPA and the vendor are similarly missing from the public record, nearly always in their entirety.[65] These inaccessible documents go to the heart of how EPA addressed the cost issue.

[62] *See* Original Brief of Industry Petitioners at 30-32, 39-40.

[63] Post Proposal Questions for GE_for EPA Review, Index.11564.3.

[64] *See* CBI_GE Response to Post Proposal Questions, Index.11680.

[65] *See* Original Brief of Industry Petitioners at 30-32, 39-40.

2. In the Final Rule, EPA Hid Cost and Effectiveness Data, Methodologies, and Analyses Behind CBI

a. Cost

Using CBI as a pretext, EPA provided only its bare conclusions in the public record regarding many of its cost analyses. The Agency has not provided supporting detail for those analyses (anonymized or otherwise). Despite comments showing that EPA had omitted or grossly underestimated various costs for the proposed rule and despite the fact that EPA *added* new technology requirements, these final costs inexplicably *decreased* on a per-plant basis for FGDW. The average capital cost per plant went from just over $21.5 million for the Proposed Rule to approximately $20.5 million for the Final Rule.[66] And the average annual O&M costs went from approximately $2.2 million to approximately $1.4 million.[67]

EPA's revised cost figures cry out for explanation. Yet, EPA suggests only that it considered public comments and changed its analysis "where appropriate," but without ever explaining *how*.[68] This is not transparency, and it certainly eliminates any opportunity for reproducibility.

[66] *Compare* Index.2920.9-28 *with* Index.12840.9-32.

[67] *Id.* (averages were calculated by dividing total industry cost by number of plants).

[68] *See, e.g.,* Index.12840.3-20 ("EPA evaluated public comments to identify plant-specific operation and flow data and, where appropriate, used this information to revise estimates of compliance costs and pollutant removals for those facilities….").

Despite the requirement to explain what it did, EPA withheld the underlying data, methodologies, and analyses under the guise of CBI. For example, they are missing from EPA's *Final Sanitized Steam Electric Incremental Costs and Pollutant Loadings Report* ("Final ICPR"), which EPA points to as "describ[ing] the methodologies used to estimate plant-specific compliance costs … associated with installing and operating the various technologies and practices that make up the regulatory options considered by EPA to revise the existing ELGs."[69] Unquestionably, this document was central to EPA's development of the Final Rule, yet information necessary to reproduce EPA's results is absent.

The Final ICPR is the only document that described EPA's consideration of costs and pollutant removals in full. The Final Technical Development Document[70] referred directly to the ICPR for detailed explanations of EPA's methodology.[71] Despite EPA's express reliance on this key document, the referenced subsections were redacted *in their entirety.* Again, this flies in the face of transparency and reproducibility.

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[69] Index.12134.1-1.

[70] EPA, *Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, EPA-821-R-15-007 (Sept. 2015), EPA-HQ-OW-2009-0819-6432 ("TDD"),

[71] *See, e.g.,* Index.12840.9-25 (indirect capital costs methodology).

In fact, EPA withheld hundreds of pages of information from the Final ICPR as CBI.[72] The table of contents revealed the titles of the missing sections and subsections, and those titles made clear the vital nature of the withheld information.[73] In Section 5 alone, one can see that basic subject matter about cost was redacted:[74]

[72] *See* Index.12134 (un-paginated placeholder between 4-35 and 9-1, noting that Sections 5, 6, 7, and 8 "have been removed from this document").

[73] *See id.* at ii-vii.

[74] *Id.* at ii-iii.

According to its title, the missing Section 5 explains EPA's "General Methodology, Terminology, and Common Cost Elements." The missing subsections provided the "General Cost Methodology and Terminology" and other more specific cost methodologies, as well as the technologies evaluated.

The same is true for Sections 6 through 8. These sections laid out EPA's methodologies for analyzing costs and technologies for treating FGDW, fly ash

transport water, and BATW.[75] EPA redacted *all* of these sections and subsections. Under the pretext of CBI, EPA withheld over 250 pages in the Final ICPR.

While these sections or subsections might contain *some* CBI, the underlying methodologies themselves are necessary to understanding what EPA did and why. These missing pages are critical to determining whether EPA's promulgation of the Final Rule was reasonable. It is impossible to reproduce EPA's cost findings without the basic details on the methodology.

b. Effectiveness of BAT Technologies

In the Final Rule, EPA claimed that "biological treatment [is] well-demonstrated" technology for the treatment of FGDW.[76] But the public record hardly supports such an overarching conclusion. Nothing in the public record demonstrates that biological treatment can treat all of the industry's FGDW effectively.

EPA focused on a combination of two treatment systems for FGDW: chemical precipitation treatment (for mercury and arsenic) followed by biological treatment (for selenium and nitrate/nitrite).[77] These treatment systems are complex, multi-component technologies that must be designed and sized to treat a

[75] *Id.* at iii-vii (Section 6, 7, and 8 entitled "FGD Wastewater Cost Methodology," "Fly Ash Transport Water Cost Methodology," and "Bottom Ash Transport Water Cost Methodology," respectively).

[76] 80 Fed. Reg. at 67,850.

[77] Proposed Rule, 78 Fed. Reg. at 34,458 (Table VIII-1).

specific mix of pollutants, in terms of pollutant type, load, and distribution.[78] The use of biological treatment for FGDW treatment – and particularly for removal of selenium – is a relatively new innovation. The complexity and variability of FGDW make it difficult to treat using biological processes, which depend on stable conditions to maintain the microorganisms on which treatment depends. For instance, changes in temperature or in wastewater constituents, such as percentage of solids or an increase in chlorides, can cause system upsets.[79]

As explained in detail in the ELG Litigation, EPA's reliance on CBI prevented any demonstration that biological treatment is effective when a plant's FGDW contains high amounts of chloride.[80] Furthermore, EPA withheld correspondence with vendors that may undermine claims regarding the general efficacy of biological treatment. In one striking document, EPA redacted nearly everything of value as CBI regarding these issues.[81] The document suggested there are difficulties or, at the very least, important variables affecting the system's capabilities:[82]

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[78] Index.2920.7-4–7-13 (EPA's description of chemical precipitation and biological treatment technologies).

[79] *See, e.g.,* Index.9123.21-23.

[80] *See* Original Brief of Industry Petitioners at 38-39.

[81] Index.11999.

[82] *Id.* at 1-2 (all redactions in original).

- "GE reports [Redacted]. While GE has [Redacted]. GE is [Redacted] to control oxidants and ORP."
- "GE reports that thus far, any issues related to high oxidants or [Redacted]. GE believes these issues with [Redacted]."
- "The ABMet™ system can process wastewater with [Redacted] nitrate concentrations. [Redacted] with a membrane bioreactor (MBR) or stirred tank system with MBR to [Redacted] prior to treatment with the ABMet™ system. Alternatively, the ABMet™ system can be designed to [Redacted]."
- "EPA inquired about any existing biological treatment systems having operational issues. GE reported [Redacted]."
- "GE indicated [Redacted]."
- "EPA inquired about the mechanism used to remove selenium from the backwash stream. GE noted that [Redacted]."

Given these extreme redactions, EPA's analysis was not transparent, and its conclusions are not reproducible.

D. EPA has Not Documented Any "Especially Rigorous Robustness Checks" on Information Supplied by Third-Party Vendors With a Financial Stake in the Rule

As a general matter, EPA's duty to perform "robustness checks" is heightened when it relies on the expertise of third parties with a financial stake in the Agency's action. According to both the OMB Data Quality Guidelines and the EPA Data Quality Guidelines, a fundamental criterion for the "quality" of information is whether the information is "unbiased."[83] If EPA chooses to rely on

[83] OMB Data Quality Guidelines at 8459; EPA Data Quality Guidelines at 15.

self-interested outside vendors, the record must establish that the Agency critically analyzed the vendors' information due to the risk of bias. "An agency may not … reflexively rubber stamp information prepared by others."[84]

Here, EPA solicited information about the cost and performance of treatment technologies from the very vendors that would benefit financially from EPA's designation of their technologies as BAT. Because EPA's verification of vendor-supplied information is not available anywhere in the record, EPA did not satisfy its obligation to establish *reasonable* reliance on that information.

E. EPA's Lack of Transparency Is Evident in Its Responses to Public Comments That Cite Information Withheld from the Public Record

It is axiomatic that responses to public comments should advance the regulatory goals of transparency and reproducibility. Yet, for the ELG Rule, EPA's responses to comments demonstrate its failure to meet these goals. In its responses to comments, EPA referenced documents withheld, in whole or part, nearly 300 times under the pretext of CBI.[85] At least 53 of those references were to sections removed from the Final ICPR, which contains EPA's analysis of costs associated with the various technologies EPA considered and ultimately selected as BAT – 5 times to Section 5 (General Methodology, Terminology, and Common

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[84] *Coliseum Square Ass'n, Inc. v. Jackson*, 465 F.3d 215, 236 (5th Cir. 2006), *cert. denied*, 552 U.S. 810 (2007) (internal quotation omitted).

[85] EPA cited documents entirely withheld 165 times and partially withheld 112 times.

Cost Elements), 30 times to Section 6 (FGD Wastewater Cost Methodology), 4 times to Section 7 (Fly Ash Transport Water Cost Methodology), and 14 times to Section 8 (Bottom Ash Transport Water Cost Methodology). Many of the "responses" corresponded to a public comment about an issue EPA is statutorily required to consider.[86] Thus, they were of central significance to the Final Rule.

Without the underlying documents referenced by EPA in its responses, the "responses" are reduced to summary conclusions. The responses cannot be reproduced or fully reviewed and, therefore, are inadequate. Referring commenters to unavailable CBI is effectively no response at all.

Beyond the policies of the Executive Orders, EPA has a legal duty to respond to public comments.[87] EPA has failed to satisfy either the regulatory policies expressed in the Executive Orders or the bare legal minimum required by the APA. Therefore, the Rule should be re-opened.

II. EPA Did Not Demonstrate That Biological Treatment is Technologically "Available"

A fundamental premise of "good science" and the regulatory reform agenda is that agencies must base regulations on adequate data. Although EPA sampled FGDW at several plants during development of the Rule, the resulting data do not

[86] For several pertinent examples pertaining to the statutory factors of cost, technical achievability, and facility age, *see* Original Brief of Industry Petitioners at 46-51.

[87] *PPG Indus., Inc. v. Costle*, 630 F.2d 462, 466 (6th Cir. 1980). *See* 5 U.S.C. § 553(c) (2015); *Nat'l Wildlife Fed'n v. Costle*, 629 F.2d 118, 134-35 (D.C. Cir. 1980).

capture the full range of FGDW variability across the broader industry as well as within a single facility throughout the year. As industry members emphasized in their comments on the proposed rule, FGDW quality is dependent on numerous factors. Those factors include coal quality, cycles of concentration in the FGD scrubber that impact chloride and other dissolved solids concentrations, residence time within the scrubber, and chloride and magnesium levels in the various reagents (*e.g.*, limestone) used in the scrubber to remove sulfur dioxide from the flue gas. In addition to the variability of FGD wastewater, industry has noted other factors that can affect the performance of biological treatment systems, specifically the FGDW chemistry, including the oxidation-reduction potential, nitrate concentration, and the various forms of selenium, some of which may be less efficiently captured in biological treatment. Other factors include cycling on and off of coal units, which can interfere with a continuous, steady FGD wastewater feed to the system, and temperature swings, which can inhibit the biological reaction rate. All of these factors can contribute to FGD wastewater variability whether the fuel is bituminous, subbituminous or lignite coal, or a blend of coals.

As just one example of this variability, the following sections focus on the differences between FGDW from bituminous and subbituminous plants and how those differences impact system performance. While EPA collected wastewater samples at a subbituminous plant, the plant did not have a biological treatment

system. In fact, *not one* of the subbituminous- or lignite-burning coal plants in EPA's database had biological treatment as part of its FGDW system.[88] Nor were any pilot test data for biological treatment available in the record for such facilities. Therefore, when promulgating the Rule, *the Agency did not demonstrate – and could not demonstrate – the feasibility of biological treatment for 16-25% of all plants (i.e., those burning subbituminous or lignite coal) subject to the new FGD limits*.[89] This was arbitrary, relied on an analysis that is not reproducible, and should be reconsidered.

Additionally, a new pilot study investigating biological treatment at a subbituminous-burning plant appears likely to demonstrate that the plant *cannot meet the FGDW limits using the technology EPA established as BAT.* UWAG is confident that these new data will confirm what industry has been saying all along: FGDW from plants burning subbituminous coal is different from that of plants burning bituminous coal, and the limits the Rule established for FGDW are

[88] The Rule's analytical database includes some data from Hatfield's Ferry, a plant that at the time burned a blend of PRB and Eastern bituminous coal. However, that plant did not have a biological treatment system for its FGD wastewater. *See* Index.1653.1.3-5. It also includes data from We Energies' Pleasant Prairie Plant which burns PRB coal but which also did not have biological treatment. *See* Index.9778.206.

[89] EPA based its estimates of plants burning subbituminous and lignite coals on EPA survey data. The survey collected information through 2009. But at the final rule stage, EPA asserted that, after accounting for "announced retirements," there were no lignite-burning plants discharging FGD wastewater. Index.10078.3-525. However, industry comments demonstrate that several lignite-burning plants are authorized to discharge FGD wastewater. *See* Index.9753.5.

therefore not appropriate. The limits also are not appropriate because plants burning bituminous coal can experience extreme FGDW variability due to a range of factors. EPA should grant this Petition and reconsider these limits based on appropriate and sufficient data that are broad enough to encompass the full range of coal-fired operations.

A. <u>Differences Among Coal Types Have Significant Implications for the Performance and Cost of Biological Treatment</u>

According to EPA, out of 100 plants identified as discharging FGDW in 2009, 15 to 20 plants burn subbituminous coal and 1 to 5 burn lignite.[90] This is important because coals vary greatly not only in their price,[91] availability, and heating value, but also in the air emissions they produce when burned,[92] the applicability and performance of air emissions control technologies,[93] and the characteristics of wastewater resulting from use of those air emissions control

[90] Index.12840.6-5(Table 6-2). EPA also identified 10-15 plants that burn two or more coal types. *Id.* Whether those plants can meet the limits is also in question.

[91] *See, e.g.,* Index.12372.215 (listing coal prices by types – bituminous, subbituminous, lignite, and anthracite – for selected years from 1949-2011).

[92] Different coals contain differing amounts and combinations of pollutants, including sulfur, hydrogen chloride, and mercury, which are important factors for designing and operating air emission technologies and managing the resulting wastewaters. *See* Index.12377.9-12.

[93] EPA has acknowledged differences between electric generating units based on coal types in other rulemakings. In the Mercury and Air Toxics Rule, EPA set different hazardous air pollutant emission standards based on coal ranks. 79 Fed. Reg. 24,073, 24,088 (Apr. 24, 2013).

technologies.[94] None of these facts is disputable. They apply with equal force to plants burning bituminous coal.

Nor can there be any dispute that steam electric units are typically designed to handle a certain coal type or types. A unit designed to burn a subbituminous coal such as PRB coal cannot simply switch to burning bituminous coal. Before any fuel switch, the facility operator would need to consider air pollution controls and permit limitations and operational changes necessary to accommodate the switch. The same is true for lignite plants. Therefore, fuel switching is not the remedy to issues arising from burning a certain variety of coal.

B. <u>The Rule Arbitrarily Ignored the Differences Between FGD Wastewater from Subbituminous Coal and FGD Wastewater from Bituminous Coal</u>

The Rule was based on several mistaken assumptions. Among them, EPA wrongly assumed that subbituminous-burning plants can achieve FGD limits derived using data for plants burning bituminous coals (and limited data at that) because biological treatment systems provide "a mechanism to reduce selenium and nitrate/[nitrite]" and because the selenium and nitrate/nitrite present in FGDW, whether derived from bituminous or subbituminous coal, "is not different."[95] The record refutes this flawed conclusion. The effectiveness and cost of wastewater

[94] Index.47.4-17 (noting pollutant concentrations in FGD scrubber purge vary due to, among other factors, "air pollution control systems operated upstream of the FGD system.").

[95] Index.10080.5-450—5-451.

treatment systems depend on the full pollutant "matrix" – that is, the specific mixture of pollutants as well as their individual characteristics – of the wastewater being treated.

The record demonstrates that FGDW from subbituminous-burning plants is substantially different from FGDW from bituminous-burning plants. The table below summarizes four-day average EPA data for FGDW exiting the chemical precipitation portions of the FGDW treatment systems at Allen and Belews Creek Stations, which burn Eastern bituminous coal, and at Pleasant Prairie Power Plant, which burns PRB coal.[96] The table compares dissolved fractions of constituents after the chemical precipitation system at all three facilities.[97]

For nitrates, the dissolved fraction of Pleasant Prairie's chemical precipitation effluent is more than *8 times* the values for both Allen and Belews Creek. For selenium, Pleasant Prairie's effluent is about *23 times* that of Allen and almost *twice* the Belews Creek value.[98]

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[96] At Belews Creek and Allen, this is a midpoint sample in the wastewater treatment system (chemical precipitation effluent), prior to biological treatment. But at Pleasant Prairie, the sampling point representing chemical precipitation effluent is the end of the FGDW treatment system since it has no biological treatment. Allen and Belews Creek use both chemical precipitation and biological treatment to treat their FGDW (Index.1992.2-2; Index.1954.2-3), while Pleasant Prairie uses a chemical precipitation system (Index.1966.2-3).

[97] *See* Index.1992.4-7–4-10(Table 4-2); Index.1954.4-16–4-18(Tables 4-4,4-5); Index.1966.4-12–4-14(Tables 4-3,4-4).

[98] The record contains additional documentation of the substantial differences in FGD wastewater influent between bituminous and subbituminous plants. *See, e.g.,* EPRI, *Pilot-Scale and Full-Scale Evaluation of Treatment Technologies for the Removal of Mercury and Selenium*

Comparison of 4-Day Average FGDW Treatment After Chemical Precipitation at Allen, Belews Creek, and Pleasant Prairie[99]

Analyte	Unit	4-Day Average Dissolved Effluent, Allen (E. Bituminous)	4-Day Average Dissolved Effluent, Belews Creek (E. Bituminous)	4-Day Average Dissolved Effluent, Pleasant Prairie (PRB)
Aluminum	(ug/l)	NQ[100]	ND	NQ
Arsenic*	(ug/l)	NQ	NQ	4.85
Boron	(ug/l)	58,600	150,000	9,930
Calcium	(ug/l)	1,750,000	3,490,000	639,000
Chloride	(mg/l)	3,300	7,780	1,950
Magnesium	(ug/l)	396,000	738,000	3,560,000
Manganese	(ug/l)	393	NQ	10,800
Mercury	(ng/l)	342	46,200	22.3
Nitrate/Nitrite	(mg/l)	13.3	19.8	160
Selenium	(ug/l)	91.1	1,210	2,080
Sodium	(ug/l)	31,300	48,900	518,000
Sulfate	(mg/l)	1,400	1,380	15,500
TDS	(mg/l)	7,560	20,100	22,400

*The pollutants highlighted are those for which EPA set new BAT limits.

In addition to the pollutants EPA chose to regulate, the values for many pollutants that EPA chose *not* to regulate – but which may affect the efficiency or

in Flue Gas Desulphurization Water, Index.12102.3-4,3-5,3-8,3-23 (showing much higher selenium and nitrate levels for the subbituminous plant).

[99] Index.1992.4-7–4-10; Index.1954.4-16–4-18; Index.1966.4-12–4-14.

[100] "NQ" means the analyte was measured above the detection limit but below the quantitation limit for all four sampling days. "ND" means the analyte was below the detection limit and could not be quantified.

proper operation of the treatment system – are also quite different. For instance, the 4-day average sulfate level in the Pleasant Prairie influent is more than 11 times that of Allen or Belews Creek. Sulfate levels can affect the operation of the system by causing calcium sulfate scaling, in which mineral deposits build up inside the treatment system's piping and equipment.[101] At Pleasant Prairie, even with lime addition as a pretreatment step, the remaining high sulfate levels necessitate weekly cleaning of the secondary clarifier.[102] Without this regular cleaning, "excessive scale would build up and affect the performance of the clarifier."[103] This scaling issue is likely to impact both the denitrification system[104] EPA added to the model technology treatment chain and the biological treatment system meant to target nitrate/nitrite and selenium removal.

The presence of high TDS also can complicate treatment of FGDW. Within the biological treatment system, high TDS may interfere with attachment sites for bacteria, lessening the effectiveness of treatment.[105] As indicated in the table

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[101] Index.12102.4-3.

[102] Index.11876 (response to Question 19).

[103] *Id.*

[104] EPA has not demonstrated the use of a denitrification system as part of FGD wastewater treatment at any plant burning subbituminous coal, even though it accounted for denitrification costs at Pleasant Prairie and Hatfield's Ferry (which burns a blend of subbituminous and bituminous coals). Index.12264.Worksheet-List_of_Plants. Nonetheless, EPA simply assumes the additional technology will not be subject to operational issues such as scaling.

[105] EPRI, Index.12102.4-4.

above, EPA's 4-day average for Pleasant Prairie demonstrates a TDS level that is about 3 times that of Allen and also higher than Belews Creek. Data in the record show that TDS levels can be as high as 50,000 mg/l,[106] which is approximately *6 times* the Allen 4-day average and almost *2.5 times* the Belews Creek average. EPA tries to negate the TDS issue by pointing to a pilot study at Petersburg Station in which TDS "ranged as high as 27,000 mg/L."[107] But Petersburg burns bituminous coal, so its results are irrelevant for subbituminous- and lignite-burning plants. Moreover, since FGDW influent can contain TDS at levels almost double the amount documented at Petersburg,[108] the pilot study fails to demonstrate that biological treatment systems can handle high TDS levels from subbituminous fuels equally as well as TDS levels from bituminous fuels.

Notably, the table also demonstrates substantial variability between bituminous-burning plants. In particular, the selenium, mercury, and TDS values for Allen and Belews Creek are very different. A review of additional bituminous plants would likely reveal even greater variability.

Without data, it is not reasonable to *assume* – as EPA did – that biological treatment systems will work for all types of FGDW. The feasibility of biological

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[106] Index.126.2-3.

[107] Index.10080.5-365 (citation omitted).

[108] Index.126.2-3.

treatment for subbituminous-, lignite-, and bituminious -burning plants must be demonstrated through actual data that are representative of system variability. Reconsideration will allow just that.

C. Including Old Pleasant Prairie Data Did Not Remedy the Lack of Biological Treatment Data for Subbituminous Plants

Industry members commented extensively on the viability of biological treatment systems for subbituminous-burning plants. We Energies, the owner of Pleasant Prairie, commented that "nothing in the rulemaking record demonstrates that facilities burning subbituminous coal can meet the proposed selenium and nitrate/nitrite limitations."[109] The company urged EPA to "recalculate effluent limitations for FGD wastewater using a more robust set of data that represents the variability of FGD wastewater across the industry" and to include data from at least one plant burning solely subbituminous coals.[110]

In response, EPA explained that, between the proposed and final rules, it decided to use Pleasant Prairie data:[111]

> By including Pleasant Prairie in the dataset, the effluent limitations are based on data that include plants burning bituminous coal, subbituminous coal, and blends of bituminous and subbituminous coals. The record demonstrates that the chemical precipitation plus biological treatment BAT basis is effective at removing the pollutants present in FGD wastewater regardless of the type of coal that is

[109] Index.8923.3.

[110] *Id.*; *see also* Index.9778.116 (UWAG).

[111] Index.10084.9-368.

> burned, and in particular those pollutants for which EPA is establishing effluent limitations. See, e.g., the pollutant removal performance for arsenic and mercury.

EPA's response was misleading. Those Pleasant Prairie data were relevant *only* to the mercury and arsenic limits, which are based on chemical precipitation. The facility did not have biological treatment. The performance of Pleasant Prairie's chemical precipitation system as to arsenic and mercury was irrelevant to the performance of the biological treatment portion of the technology. Thus, EPA was wrong that "[t]he record demonstrates that the chemical precipitation plus biological treatment BAT basis is effective at removing the pollutants present in FGD wastewater regardless of the type of coal that is burned."[112]

EPA further misled by claiming: "The data in the record also shows that the biological treatment technology is effective at removing nitrate-nitrite and the different forms of selenium present in FGD wastewater; *that is proven true for every type of coal that has been tested with the technology*."[113] Note EPA's qualified language: biological treatment is effective for "every type of coal *that has been tested with the technology*." That is the point. As of the final ELG Rule, subbituminous and lignite coal had not been tested with the technology, and thus

[112] Contrary to EPA's assertion, it also has not demonstrated that plants burning a blend of bituminous and subbituminous coals can meet the selenium and nitrate/nitrite limits. The only plant burning a blend of coals during EPA's sampling was Hatfield's Ferry, which had no biological treatment system.

[113] *Id.* (emphasis added).

the *technology is not demonstrated for those coal types.* To set limits without appropriate supporting data was arbitrary and capricious and should be reconsidered.[114]

D. **<u>EPA's Theorizing About the Efficacy of Biological Treatment Did Not Satisfy its Obligation to Base Limits on *Demonstrated* Performance</u>**

Lacking data, EPA nonetheless declared there is no "theoretical reason" why biological treatment would not be effective at plants burning subbituminous coal.[115] It based its "theoretical" judgment on two specious arguments.

First, EPA said that "[t]here is nothing unique about the form of selenium or nitrate-nitrite that is present in FGD wastewater at plants burning subbituminous (or any other type of coal) …."[116] This statement misses the point. Although the specific types of selenium and nitrate/nitrite in FGDW may generally be the same across coal types, the differences between FGD *wastewater* from bituminous coals and that from subbituminous coals can be significant.[117] As shown by EPA's own

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[114] *See Chemical Mfrs. Ass'n v. EPA,* 885 F.2d 253, 265 (5th Cir. 1989), *cert. denied sub nom. PPG Indus. v. EPA*, 495 U.S. 910 (1990) (EPA failed to demonstrate a "reasonable basis for its conclusion" where it tried to use data from end-of-pipe biological treatment systems to justify in-plant biological treatment systems).

[115] Index.10084.9-368.

[116] *Id.*

[117] And as already noted, EPA failed to capture the variability of FGDW across the industry. Even two plants burning bituminous coal can have very different FGDW characteristics due to differences in coal constituents or differences in operational conditions, such as cycles of concentration within the scrubbers.

data for the Allen, Belews Creek, and Pleasant Prairie plants, the wastewaters differ in material ways.

Nonetheless, EPA simply asserted that "the characteristics of wastewater from subbituminous plants (as evidenced by the data for Pleasant Prairie ...) are similar to the characteristics of wastewater from plants burning bituminous coal (i.e., … Belews Creek …)."[118] It is simply not true that all concentrations and characteristics of FGDW from subbituminous plants are similar to those for bituminous plants.[119] But even if they were "similar," comparing pollutant concentrations is not sufficient for demonstrating that biological treatment is feasible and available for subbituminous and lignite plants.[120]

Second, the Agency claimed it considered and ruled out whether other pollutants or wastewater characteristics unique to subbituminous coal would

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[118] *Id.*

[119] *See supra* at 54-58.

[120] At the proposed rule stage, EPA did not include data from Pleasant Prairie, the only subbituminous-burning plant it sampled. EPA, *Technical Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, EPA-821-R-13-002 (Apr. 2013), EPA-HQ-OW-2009-0819-2257 at 10-6. But for the Final Rule, EPA included mercury and arsenic data from Pleasant Prairie in the dataset used to derive the FGD limits. Analytical Database for the Steam Electric Rulemaking, EPA-HQ-OW-2009-0819-5640. As a result of including the Pleasant Prairie data, the mercury daily maximum limit rose from 242 to 788 nanograms per liter, and the mercury monthly average rose from 119 to 356 nanograms per liter. Both arsenic limits also increased. The magnitude of the mercury changes are very significant, and indicate that including data from subbituminous-burning plants is essential to deriving appropriate limits.

potentially interfere with biological treatment.[121] With this statement, EPA waved away possible operational difficulties from scaling (as can be caused by high sulfate levels) or from high TDS (which can potentially impact biological treatment performance). Yet, these problems occur at facilities burning subbituminous coals, and EPA's justification was patently inadequate.

It is telling that, when promulgating the Rule, EPA urged all plants to perform site-specific pilot studies before installing FGDW equipment.[122] These studies are necessary, according to EPA, to assess wastewater characteristics and determine the most appropriate technologies and their design (*e.g.*, sufficient capacity and residence time) to handle the variability of the particular FGD wastewater.[123] EPA specified that the studies should be conducted "over a long enough period of time that will include variability in plant operations such as shutdowns, fuel switches (preferably for all fuel types burned at the plant), variability in electricity generating loads, periods with high [oxidation reduction potential], etc."[124] EPA recommended that a plant "identify the 'worst case' scenario and design a sufficient FGDW treatment system that can operate under

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[121] Index.10084.9-368.

[122] Index.12006.14–16.

[123] *Id.*

[124] *Id.* at 15–16.

the worst case conditions and achieve the effluent limits."[125] Many of EPA's recommendations would significantly increase the complexity and cost of FGDW treatment.

EPA's own recommendations, and the reasoning underlying them, flatly contradict EPA's assertion that variability among FGD wastestreams among plants, and over time at a given plant, has no effect on the achievability of the limits or the cost of technology. Indeed, pilot studies are necessary *because of the unpredictable variability of FGDW.*[126] EPA was acknowledging the uniqueness of each FGDW at each given plant. This acknowledgement demonstrates that the Rule could not have taken into account all of the site-specific technologies needed to achieve the final effluent limits for FGD wastewater, including technologies needed at subbituminous-burning plants as well as at bituminous-burning plants. And, without a full consideration of site-specific design factors, EPA could not have properly derived costs for FGD compliance at all facilities.[127]

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[125] Index.12006.16.

[126] GE, a vendor of biological treatment systems, acknowledges the "*extreme variability* in effluent quality [i.e., FGD wastewater influent to the treatment system] due to the variety of coal sources, limestone sources, and scrubber operation…." J. Sonstegard, et al., ABMet: Setting the Standard for Selenium Removal, Index.250.2 (emphasis added).

[127] The same is true for derivation of costs for indirect dischargers attempting to meet the FGD limits. Several small public power facilities face daunting costs to comply with the mandated mercury, arsenic, selenium, and nitrates limits.

In responses to comments on the Rule, EPA also retorted that commenters had not provided data to prove subbituminous- or lignite-burning plants would be unable to meet the effluent limitations.[128] This, of course, turned EPA's regulatory obligation on its head. Since no subbituminous- or lignite-burning plants had installed the biological treatment system that EPA claimed is BAT, it would have been difficult indeed to produce such data. But that is beside the point. The burden is not on industry to prove why it should *not* be regulated. The burden is on EPA to justify regulation. Here, by statute, EPA was obliged to establish that the BAT technology is technologically "available" for the whole industrial category, including bituminous-, subbituminous-, and lignite-burning plants.

EPA also contended there is no evidence of possible interferences with biological treatment stemming from FGDW derived from subbituminous coal.[129] But that is a theoretical judgment unsupported by any performance data. It asserted that a "well operated" PRB-burning plant should have no issues meeting the limits.[130] Again, that is all theory, unsupported by any credible analysis.

With as much as 25% of the coal fleet dependent upon subbituminous or lignite coals, EPA's speculation is no small matter. EPA's database does not

[128] Index.10080.5-166, .10078.3-525.

[129] Index.10084.9-368.

[130] Index.10080.5-148. If, in the absence of data, it is sufficient merely to say that a "well operated" plant should be able to meet a limit, then EPA could justify any conceivable limit.

reflect the true variability of FGDW. Selecting model technologies and setting limits on an incomplete database is not consistent with the regulatory reform agenda. The large range of FGDW variability affects all plants no matter their coal type.

For these reasons, EPA should reconsider the FGDW limits in the Final Rule.

E. New Data Are Likely to Demonstrate that Plants Burning Subbituminous and Bituminous Coal Cannot Comply With The Rule's Limits Through Use of EPA's Model Technology

After EPA published the Final Rule, EPRI initiated a pilot study of the Rule's model biological treatment technology at Pleasant Prairie, a plant burning 100% subbituminous PRB coal. The results of that pilot study are yet to be released, but UWAG believes they will support what industry has reiterated: (1) treating FGDW from plants burning subbituminous coal will be substantially more difficult than treating FGDW from plants burning bituminous coal; and (2) the model biological treatment technology for FGDW treatment is not demonstrated for use with FGDW from subbituminous plants. EPRI is likely to publish the final report within the next few weeks.

Also, new data collected by AEP illustrates that variability in wastewater management can also impact performance at bituminous plants such that additional technologies beyond EPA's model technology will be needed to achieve the limits.

If these new data are indeed contrary to EPA's assumption that biological treatment systems will function equally as well no matter the type of coal being burned, then they will further demonstrate why EPA must reconsider the limits for FGD wastewater.

III. EPA Violated Principles of Data Quality and Transparency in Characterizing Bottom Ash Transport Water

The Final Rule imposed a zero discharge requirement for BATW.[131] Every plant currently discharging any BATW (aside from oil-fired units and units less than 50 megawatts) must convert its systems to prevent any BATW discharge whatsoever.[132] This single requirement exacts a very heavy price. According to EPA, *103 plants must retrofit their BATW systems as a result of the Rule, at a total industry capital cost of over $2.5 billion* and annual operations and maintenance costs of $133 million (2010$).[133] Based on anecdotal reports, UWAG is confident EPA's cost estimate is a gross underestimate. However, the public cannot evaluate

[131] 40 C.F.R. § 423.13(k)(1)(i).

[132] The Rule provides two limited exemptions for discharges of BATW. First, plants can discharge "low volume, short duration" discharges from minor leaks or minor maintenance events. 40 C.F.R. § 423.11(p). Second, plants can discharge BATW if it is reused as makeup water in the FGD scrubber and thus subject to the FGD wastewater discharge limits. 40 C.F.R. § 423.13(k)(1)(i).

[133] TDD at Table 9-10, 9-45.

the estimate because EPA's estimates of plant-specific costs are not available for public review.[134]

EPA should have carefully selected the data used to justify this level of impact. But that was not the case. EPA's BATW data suffers from a plethora of data quality issues, all of which affect EPA's analyses. The following types of flaws infect the BATW data: (1) inconsistencies with EPA's own data acceptance criteria; (2) errors in units of measure; (3) use of unacceptable or obsolete analytical methods; and (4) application of overly conservative methodologies addressing non-detect analytical results. For example, EPA's analytical database uses the wrong units of measure for a mercury datapoint at the Kammer plant. The units should be nanograms per liter (parts per trillion) rather than micrograms per liter (parts per billion).[135] In addition, EPA used detection limits from older analytical methods to estimate pollutant concentrations even though the laboratory reported the pollutants were not detected in the samples. These unacceptable practices resulted in an overestimation of pollutant loadings for BATW. These sorts of errors justify reconsideration.

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[134] *See* EPA's Final ICPR. The portions of that document containing plant-specific costs (EPA-HQ-OW-2009-0819-6472.ATT1, ATT2) have been redacted from the record in their entirety.

[135] Analytical Database for the Steam Electric Rulemaking, EPA-HQ-OW-2009-0819-5640.

Additionally, EPA chose to include 27 samples of *40-year-old* data from *unidentified sources* as part of its BATW dataset. Because the sources of the data are neither identified nor described with relevant detail, the public cannot determine critical facts that go to the legitimacy of the data. For instance, EPA did not address whether the plants that supplied the data are still operating, whether the ash ponds sampled are still discharging, or whether the materials contained in the particular ash ponds are the same as when sampling occurred. It is impossible for the public to determine the ash pond management practices that would apply to the data or to determine whether, since the data were gathered, practices have changed. In short, there is no way for the public to determine whether the data are representative of *current* industry discharges. This lack of transparency is contrary to the goals of regulatory reform and the Office of Management and Budget's and EPA's own rules on the validity of data.[136]

The quality of the data was also dubious. EPA failed to provide any quality control/quality assurance information for the 27 samples. Moreover, EPA did not disclose either the laboratory methods used to analyze the samples or the actual laboratory reports to substantiate the data. Instead, the 40-year old values are

[136] *See* Exec. Order 13777, 82 Fed. Reg. at 12,286 (Mar. 1, 2017) (requiring evaluation of rules relying in whole or part on "data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility").

simply copied out of an outdated EPA report – *itself more than 30 years old* – with no proper supporting documentation.

Also, EPA used the poor quality BATW characterization data as a basis for several important purposes, including calculating a cost-effectiveness ratio. Since the underlying BATW characterization data was poor quality, the cost-effectiveness analysis is flawed. An agency has an obligation to base its analysis on acceptable data. In this case, EPA did not do so.

In the 21st century, data unsupported by routine quality control/quality assurance checks and proper documentation are not considered reliable data, and they should not be used to compel expenditures of $2.5 billion or more. Reconsideration of the BATW limits is appropriate.

The following sections explain how EPA selected BATW characterization data and why the data are critical to EPA's BATW decisions.

A. EPA Failed to Gather Current BATW Data

Despite site visits to 68 steam electric plants prior to the proposed ELG rule,[137] EPA collected only one sample of BATW.[138] EPA obtained this sample in 2007, almost 2 years before it decided to revise the steam electric ELGs. The lack of additional BATW samples during the course of the rulemaking was a curious

[137] 78 Fed. Reg. at 34,444.

[138] EPA sampled BATW at the Homer City Power Plant in August 2007. Final Detailed Study at 2-10.

omission that did not go unnoticed. Industry urged EPA to gather more BATW samples, but EPA never did so.

B. EPA Relied on Old Data from Unidentified Sources

The 1973-1976 data EPA used as part of its BATW dataset derive from 27 samples collected at three unidentified Tennessee Valley Authority plants. EPA first presented these data ("old TDD data") in 1980 as part of the proposed Development Document for the steam electric point source category.[139] EPA then incorporated them into Appendix A of the final 1982 Development Document.[140] In a memorandum describing its 2015 review of data for ash transport water, EPA noted that the 1982 Appendix A plants are "unidentified."[141] Incredibly, EPA decided to use the data even though it did not match the data with an individual plant or discharge point, and even though it has other sources of data, such as *current* data supplied by industry.[142]

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[139] EPA, *Development Document for Effluent Limitations Guidelines and Standards for the Steam Electric Point Source Category* (Sept. 1980), EPA-HQ-OW-2009-0819-5450-Att21 at 514-27, 552-56.

[140] EPA, *Development Document for Final Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Steam Electric Point Source Category* (Nov. 1982), EPA-HQ-OW-2009-0819-2186, Appendix A at 571-84, 609-13.

[141] ERG, *Ash Transport Water Analytical Data Review Methodology Memorandum* (Sept. 30, 2015), EPA-HQ-OW-2009-0819-6349 at 15.

[142] This use of data from unidentified plants is distinct from EPA's general practice of "anonymizing" data used in ELG rulemakings to protect CBI. When EPA uses codes instead of plant names and other identifying information to protect CBI, it nonetheless has identified for itself the plants supplying the data, and therefore the Agency has the means to satisfy itself that the data are representative. In this case, EPA admits that the plants are "unidentified."

In addition to the old TDD data, EPA's BATW analytical database uses more current industry-generated data and EPA's single 2007 sample. However, the old TDD data is a significant and influential component of the database, comprising approximately 28% of all the parameter data points used by EPA to characterize BATW for the Rule.[143]

C. <u>Use of Data from Unidentified Sources Prevents Proper Data Evaluation</u>

Without being able to tie the old TDD data to specific plants, one cannot properly evaluate whether the data are representative because key plant characteristics are unknown. EPA itself acknowledged several operating procedures that can affect BATW characteristics, including:

- adding chemicals to ash ponds to control pH;
- injecting carbon dioxide into the pond to reduce alkalinity;
- adding polymers to the pond to enhance settling; and
- adding acidic wastestreams to the pond, which can increase the metals concentration in the effluent.[144]

Without knowing the plants' identities, it is impossible to tell whether the plants used any of these methods during the sampling period or whether the plants now employ these methods.

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[143] EPA used a total of 2,252 data points to characterize BATW loadings. Of that amount, it derived 632 data points from the old TDD data. EPA, Analytical Database for Steam Electric Rulemaking, EPA-HQ-OW-2009-0819-5640.

[144] Final Detailed Study at 5-13, 5-15.

In sum, there is no way for EPA or the public to know if the data are representative of current industry discharges. EPA admitted that "[t]he processes employed and pollutants discharged by the industry look very different today than they did in 1982."[145] We agree. The processes employed to manage ash ponds – and the ash ponds themselves – have changed since the 1970s, when the old TDD data were collected. The Rule must be reconsidered to use more recent, reliable data in setting BATW limits.

D. The Old TDD Data Are Not Representative Because New Regulations Took Effect in 1974 and 1982

Changing regulations dramatically changed how the industry handled BATW over the years. Old data are therefore not representative of current BATW. The old TDD data, as already noted, were collected and analyzed in 1973-1976. The first steam electric ELGs became effective on November 7, 1974.[146] That rule stayed in effect until EPA revised the steam electric ELGs in 1982.[147]

Since 16 out of the 27 "old TDD data" samples were collected prior to November 7, 1974,[148] those samples do not reflect either the 1974 ELG rule or the 1982 revisions. Under the 1974 rule, existing facilities had to recycle BATW 12.5

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[145] 80 Fed. Reg. at 67,840.

[146] 39 Fed. Reg. 36,186, 36,198 (Oct. 8, 1974).

[147] 47 Fed. Reg. 52,290 (Nov. 19, 1982).

[148] EPA lists the dates of the samples on Tables A-2, A-4, and A-13 of Appendix A of the 1982 Development Document, pp. A-5–A8, A-12–A-14, A-43.

times before discharging and were subject to numeric total suspended solids (TSS) and oil and grease limits.[149] New sources faced stricter requirements; they had to recycle BATW 20 times before discharging.[150] The 1974 regulation also set a pH range for all discharges of 6.0-9.0.[151] Because the pH of a pond can affect metal concentrations in the discharge, requiring ash ponds to operate within a pH range likely changed the discharges from the ponds. For these reasons, the 16 samples pre-dating the 1974 rule cannot be representative of current BATW discharges because they do not reflect current discharge limits.

The remaining 11 "old TDD data" samples pre-date the 1982 revisions. In that revision, EPA deleted the existing and new facility requirements to recycle BATW. That change alone is very significant and would have affected how ponds operate. Therefore, whether the old TDD data (both the 16 samples pre-dating the 1974 rule and the 11 samples pre-dating the 1982 revisions) are representative of current industry discharges is unknown.

E. <u>The BATW Characterization Data Were Integral to EPA's Rulemaking Processes</u>

Despite its many flaws, EPA used the BATW analytical data for several critical rulemaking functions. First, it used the sample analytical data to define

[149] 40 C.F.R. § 423.13(d) (1975).

[150] 40 C.F.R. § 423.15(d) (1975).

[151] 40 C.F.R. § 423.12(b)(1) (1975).

"pollutants of concern" or POCs. For BATW, EPA defined POCs as "those pollutants that are confirmed to be present at sufficient frequency in untreated wastewater samples of that wastestream."[152] EPA identified 37 BATW POCs.[153]

Second, using the defined POCs for the particular wastestream,[154] EPA calculated plant-specific loadings for baseline discharges and then totaled them to estimate current industry-wide pollutant loadings for the wastestream.[155] After calculating the baseline discharge, EPA estimated the amount of pollutants removed by the chosen technology option.[156]

Once EPA calculated pollutant pounds removed, it also calculated "toxic weighted pounds equivalent" or TWPEs. As EPA explained:

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[152] 80 Fed. Reg. at 87,647.

[153] TDD, Table 6-16 at 6-25 to 6-26. EPA established several protocols for accepting data used to define POCs. For example, (1) samples must be representative of full-scale plant operations; (2) for BATW, the sample must comprise at least 75% by volume BATW; and (3) source water sample data that are paired with wastewater sample data must be taken within a day of the wastewater sample collection date. TDD at 6-17 to 6-18. But Petitioners cannot substantiate whether EPA followed its own protocols as to BATW POC data because documents detailing EPA's POC evaluation are redacted in their entirety from the record available for public review. *See Memorandum-Bottom Ash and Fly Ash Transport Water Pollutants of Concern (POC) Analysis Methodology* (EPA-HQ-OW-2009-0819-6049); *Analysis-Source Water Ash Treatment Analysis Final* (EPA-HQ-OW-2009-0819-6048); and *Analysis-Pollutants of Concern Ash Treatment Analysis Final* (EPA-HQ-OW-2009-0819-6050).

[154] "The industry-level baseline loadings presented in Table 10-14 include only those pollutants identified as POCs…." TDD at 10-34.

[155] EPA lowered the numbers of plants with bottom ash ponds from 115 to 84 to account for the effect of the Clean Power Plan. *Cf.* TDD Table 10-14 to Table 10-15 at 10-34–10-36. Again, Petitioners cannot substantiate either number because EPA's underlying analysis is not part of the record available for public review. And, of course, any change in the CPP Rule will affect the number of plants likely to be affected by the ELG Rule.

[156] TDD, Tables 10-16 and 10-17 at 10-37.

> EPA uses toxic weighting factors (TWFs) to account for differences in toxicity across pollutants.... EPA calculated a toxic-weighted pound-equivalent (TWPE) value for each pollutant discharged to compare mass loadings of different pollutants based on their toxicity. To perform this comparison, EPA multiplied the mass loadings of pollutant in pounds/year by the pollutant-specific TWF to derive a "toxic-equivalent" loading (lb equivalent/yr), or TWPE.[157]

Using pounds of pollutant removed and/or TWPE calculations, EPA completed several essential elements of its rulemaking analysis:

1. It compared the pollutant removal efficacy of the technology options for BATW.

2. It used the baseline loading and estimated pollutant removals as a major input to the Environmental Assessment, a 513-page document prepared "to evaluate the environmental impact of pollutant loadings released under current (*i.e.*, baseline) discharge practices and assess the potential environmental improvement from pollutant loading removals under the final rule."[158]

3. It calculated the cost-effectiveness of the Rule as the cost per pound of TWPEs removed, for comparison to the cost-effectiveness of other effluent guidelines rulemakings.

4. It compared the total estimated costs of the Rule to the total estimated benefits (*i.e.*, benefits based on EPA's estimate of the pounds of pollutants removed from receiving waterbodies).[159]

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[157] TDD at 10-3.

[158] EPA, *Environmental Assessment for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, EPA-821-R-15-006 (Sept. 2015), EPA-HQ-OW-2009-0819-6427 at 1-1.

[159] *See* EPA, *Benefit and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, EPA-821-R-15-005 (Sept. 2015), EPA-HQ-OW-2009-0819-5856.

Despite their serious flaws, the BATW characterization data, therefore, were critical building blocks for much of the Agency's rulemaking processes.

F. EPA's Cost-effectiveness Analysis for BATW is Flawed

EPA's cost-effectiveness analyses illustrate the importance of selecting the right BATW characterization data. The flawed dataset that EPA used for BATW characterization affected EPA's cost-effectiveness analysis by increasing the amount of pollutant loadings attributable to BATW. While EPA was quick to note that a cost-effectiveness analysis is "not required by the CWA, and not a determining factor for establishing BAT,"[160] this analysis allowed EPA to compare the effectiveness of candidate technologies while factoring in the costs of those technologies. Using this metric also allowed EPA to compare the cost-effectiveness of a portion or the Rule (or the entire Rule) to recently promulgated BAT limitations for other industries, which range from less than $1 per TWPE to $404 per TWPE.[161]

In the proposed ELG Rule, EPA estimated that a zero discharge approach to BATW would cost $107 per TWPE.[162] At the proposed rule stage, UWAG

[160] 80 Fed. Reg. at 67,881.

[161] *Id.*

[162] EPA, *Technical Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, EPA-821-R-13-002 (April 2013), EPA-HQ-OW-2009-0819-2257 at 8-34; see also 78 Fed. Reg. at 34,474 col. 1.

challenged EPA's BATW cost-effectiveness analysis on several grounds, including the use of old or otherwise invalid data.[163] When UWAG calculated its own cost-effectiveness ratio for BATW, using better quality characterization data and more realistic capital costs, it ranged from $1,635 to $16,492 per TWPE.[164] Therefore, UWAG's estimate for the ELG Rule was *4 to 41 times greater than $404 per TWPE,* the highest historical BAT cost-effectiveness ratio that EPA had ever used.

In the Final Rule, EPA adjusted the characterization data it used for BATW to eliminate some of the data that UWAG pointed to as old and invalid. But it substituted in other old 1970s-1980s data from unidentified plants, as well as newer data that in some cases were misinterpreted. Based on the new dataset, EPA calculated a new cost-effectiveness ratio for BATW of $314-457 per TWPE, or about 3 to 4 times its original estimate.[165] Nonetheless, EPA found that the cost-effectiveness of the total final rule was in the range of $136-149 per TWPE.[166]

Even after EPA's adjustments for the final rule, the BATW characterization dataset is of unacceptable quality, for the many reasons previously noted, which resulted in a significant overestimation of pollutant loadings attributed to BATW. Having undertaken to consider cost-effectiveness – and having used it as a primary

[163] UWAG Sept. 2013 Comments at 79.

[164] *Id.*

[165] 80 Fed. Reg. at 67,882.

[166] *Id.*

tool across multiple effluent guidelines rules – EPA had an obligation to use acceptable data in its analysis. It failed to do so.

Whether or not the CWA requires EPA to perform a cost-effectiveness analysis of BAT determinations, it is good administrative practice to do so. Since EPA's cost-effectiveness analysis depends on the quality of the underlying pollutant loading data and those data are derived from BATW characterization data, if the characterization data are flawed, then the whole cost effectiveness analysis is flawed and should be reconsidered.

The lack of transparency is reason alone to reevaluate an EPA decision that the Agency admits will cost *at least $2.5 billion*. When coupled with the serious concerns about the representativeness and accuracy of the data, it is clear that reconsideration is appropriate and that an administrative stay during reconsideration is likewise appropriate.

IV. New Data Also Demonstrate that the Rule's IGCC Limits are Technologically Infeasible

Sufficiency of data is another core requirement for sound regulation.[167] For IGCC plants, EPA badly missed the mark. The IGCC limits in the Rule were based on an insufficient and unrepresentative dataset. Newly available data prove

[167] "Each agency shall base its decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and consequences of, the intended regulation." Executive Order 12866, *Regulatory Planning and Review* (Sept. 30, 1993), 58 Fed. Reg. 51,735, 51,736 (Oct. 4, 1993).

that industry's concerns about the limits were justified. The new data show that the limits for IGCC wastewater cannot reliably be met. Indeed, a brand new, state-of-the-art IGCC facility cannot meet the limits, *even though it employs what EPA deemed to be "model" technology.*

The record is clear that EPA relied on incomplete and inappropriate data in setting the IGCC limits. The new facility – Duke Energy Indiana's Edwardsport[168] – uses a two-stage gasification wastewater treatment system. Two-stage treatment produces far less wastewater, but that residual wastewater (known as "crystallizer effluent") has higher pollutant concentrations than does the wastewater from one-stage treatment (known as "vapor compression effluent"). Duke commenced construction of Edwardsport in 2008, and commercial operations began in June 2013, the same month in which EPA published the proposed ELG Rule.

To develop the gasification wastewater limits, EPA gathered gasification wastewater characterization data from two other IGCC facilities that had been in operation for many years: Wabash River (which used one-stage treatment and which has since closed) and Polk (which uses two-stage treatment). Despite

[168] Edwardsport qualifies under the Rule as an "existing facility," not a "new" facility, because it commenced construction long before the ELG Rule was proposed, much less finalized.

having limited data from only two facilities,[169] EPA discarded Polk's crystallizer effluent data because the Agency believed Polk's crystallizer was malfunctioning at the time of sampling.[170] With that decision, EPA rejected its only crystallizer effluent data (*i.e.*, data most likely to be similar to the crystallizer effluent that the state-of-the-art Edwardsport plant would generate). Notwithstanding the data shortcomings, EPA did not seek to obtain replacement data from Polk. Despite comments from industry expressing concern about the lack of sufficient IGCC-specific data in the record[171] and the numerous technical differences between the limited number of IGCC facilities in operation,[172] EPA used only vapor compression effluent data from Polk (representing one-stage treatment) to set the final limits for arsenic and mercury.[173]

Data from Edwardsport demonstrate that a state-of-the-art plant with two-stage treatment cannot meet the limits. EPA set gasification wastewater limits for arsenic, mercury, selenium, and TDS. The summary table below compares

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[169] The dataset collected by EPA included only four daily effluent samples from each facility. In Polk's case, there were four daily samples of effluent from the intermediate vapor compression step and four samples of final effluent from the crystallizer.

[170] Index.2920.13-20; Index.12840.13-26-13-27.

[171] Index.8684. 78-81 (Duke Energy) (discussing inadequacies of data set for setting reliably achievable gasification wastewater limits), Index 9778.289-91 (UWAG) (discussing inadequacies of gasification wastewater data set).

[172] Index.8684.77-78; Index.9778.287-89.

[173] The effluent data from Wabash River were also used by EPA in setting ELG limits for selenium and TDS. However, it is the ELG limit for mercury that poses Edwardsport's greatest compliance challenge.

Edwardsport arsenic, mercury, and TDS data from May 2013- October 2015 to the ELG limits.[174]

Parameter	Edwardsport Daily Maximum	ELG Daily Maximum	Edwardsport 30-day Average	ELG 30-day Average
Arsenic, total ug/L)	15	4	--	--
Mercury, total (ng/L)	12.8	1.8	9.1[a]	1.3
Total dissolved solids (TDS) (mg/L)	222	38	67.2[b]	22

a=September 2015 average (highest 30-day average)
b=October 2015 average (highest 30-day average)

Since 2015, Edwardsport gasification wastewater effluent continues to exceed the arsenic, mercury, and TDS limits. According to its renewed wastewater discharge permit, the new ELG limits will be applicable to Edwardsport in April 2021.

Because the existing $120 million gasification wastewater treatment system cannot consistently meet the limits, Edwardsport was forced to file a request for a fundamentally different factor variance[175] and is awaiting a response from EPA Region V. Variances from ELG limits are very rarely granted – none thus far have been granted under the Rule. If Edwardsport is denied a variance, its options will

[174] The Edwardsport data are based on 27 samples, as documented in Appendix 1 to Duke Energy Indiana, LLC's Application for a Fundamentally Different Factor Variance, Edwardsport IGCC Station, NPDES Permit IN0002780, submitted to EPA Region V and Indiana Dept. of Environmental Management (April 27, 2016) ("Duke FDFV Application"), attached as Exhibit 3 to this Petition.

[175] Duke FDFV Application.

be to (1) identify, design, and install one-of-a-kind wastewater treatment technologies in the hope of achieving consistent compliance; or (2) stop operating. By statute, BAT must be based on "available" technologies. Companies should not be forced *after* an ELG is issued to explore new and untested technologies in the hope of meeting the limits.

This is how a rule based on woefully insufficient data penalizes industry and imposes excessive costs on society. Duke – despite its substantial efforts to design, construct, and operate a costly state-of-the-art IGCC facility – has been forced into an uncertain position as a result of the Rule's unreasonable and unsubstantiated limits. Well-developed rules are supported by appropriate data and do not cause lingering uncertainties; they allow businesses to make efficient, cost-effective decisions. The limits for IGCC facilities are an example of the worst type of regulatory outcome: requirements that (1) are technologically infeasible and (2) increase costs and exacerbate business stagnation due to uncertainty.

V. Cumulatively, the ELG Rule and Other Rules Are Having Devastating Economic Impacts

It is undeniable that the convergence of the ELG Rule and other rules affecting coal-fired power plants is causing adverse economic impacts. The other rules include the CCR rule, the CPP rule, and the CWIS rule. First, the cumulative compliance costs are massive. As a result, the rules will cause and contribute to

plant closures and job losses. Second, the lack of coordination among the rules (and in particular the compliance deadlines they set) magnifies business uncertainty and expense. Third, the CPP and the CCR rule have seen their status change since promulgation of the ELG Rule. Both are in litigation and subject to further changes, thus exacerbating uncertainty about the costs and plant closures attributable specifically to the ELG Rule and whether and how the rules can be harmonized.

The cumulative impact of all these rules makes the ELG Rule a prime candidate for reconsideration to promote regulatory reform policies.

A. For Coal-Fired Units, the Cumulative Compliance Costs and Job Losses From EPA Rules Are Staggering

EPA's own estimates[176] of the costs of the ELG, CCR, CPP, and CWIS rules demonstrate the adverse economics the coal-fired fleet is facing. EPA claims the *annualized* total social costs of the ELG and CWIS rules will be $471.2-479.5 million (2013$) and $274.9 million (2011$), respectively.[177] The Agency estimates the total *annualized* incremental costs of the CCR rule will be $509-735 million (2013$) (over 100 years).[178] The CPP alone is projected to cost billions per year. EPA predicts annual illustrative compliance costs of $1.4-2.5 billion (2020),

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[176] Again, industry does not accept EPA's estimates. In fact, industry believes EPA grossly underestimated the costs of many of these rules.

[177] 80 Fed. Reg. at 67,865 (ELG Rule); 79 Fed. Reg. at 48,415 (CWIS Rule).

[178] 80 Fed. Reg. at 21,309.

$1.0-3.0 billion (2025), and $5.1-8.4 billion (2050) (all in 2011$).[179] Cumulatively, these rules are projected annually to cost the coal-fired industry (and their customers) billions of dollars for many years.

While the CPP and the CCR rules are being substantially changed, UWAG members are incurring the heavy costs of complying or planning to comply with the ELG rule. Dynegy Inc. recently estimated its costs of compliance to total approximately $308 million, with $41 million to be spent in less than one year and $178 million to be spent within 3 years.[180] Dynegy's costs are not unique. NRG, another UWAG member, anticipates that its total ELG costs will be approximately $200 million.[181] AEP has included in its total projected environmental investments for 2018 through 2025 ELG Rule compliance costs ranging from $400-$550 million through 2023.[182]

Smaller, local utilities are likewise experiencing high compliance costs relative to their lower numbers of ratepayers. For instance, City Utilities of Springfield, Missouri is a community-owned utility. It is a component of the City of Springfield and is overseen by a board of local citizens. It operates electric

[179] 80 Fed. Reg. at 64,680-81.

[180] Dynegy Inc., Form 10-K, filed with the U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016 (Feb. 27, 2017) at 18.

[181] NRG, Form 10-K, filed with the U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016 (Feb. 28, 2017) at 32.

[182] AEP, Inc. Form 10K, filed with the U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016 (Feb. 28, 2017) at 14.

generating capacity of 1,120 MW, providing electricity to approximately 112,000 customers over a 320-square mile area. To comply with the ELG Rule, City Utilities has already spent $4 million in capital costs and will need to spend an additional $3 million in capital costs if the "zero discharge" BATW requirement stands, exclusive of additional annual operating costs. This is in addition to the significant costs to comply with the CCR Rule at an estimated total cost of $14 million.

Since the ELG Rule phases in compliance from November 1, 2018, through December 31, 2023,[183] prompt reconsideration of the Rule offers a potential of relief from some of these costs.[184]

Unit and facility closures based on the cumulative impact of these rules are inevitable. In 2015, when EPA promulgated another rule affecting coal-fired power plants (the Mercury and Air Toxics Standards rule), utilities were forced to retire almost 14 gigawatts of coal-fired generation.[185] That represented more than

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[183] 80 Fed. Reg. at 67,854.

[184] Some public power utilities are experiencing especially acute impacts from the Rule's deadlines because they are indirect dischargers. Instead of phased-in compliance deadlines, they face a fixed deadline of November 1, 2018, as indirect dischargers subject to Pretreatment Standards for New Sources ("PSNS") and Pretreatment Standards for Existing Sources ("PSES"). Thus, those dischargers are making significant capital investment decisions without knowing the ultimate fate of the CPP or CCR rules (or, indeed, the ELG Rule itself if this petition is granted). Reconsideration, coupled with a suspension of the deadline, is imperative for them.

[185] U.S. Energy Information Admin., *Coal made up more than 80% of retired electricity generating capacity in 2015,* (available at www.eia.gov.todayinenergy/detail.php?id=25272).

80% of all 2015 retirements.[186] Similar impacts from the current batch of rules are likely. EPA itself estimated that, due to the CPP rule alone, 47 plants and another 19 units that otherwise would be subject to the ELG Rule would close or be repowered.[187]

Job losses are a natural consequence of unit and facility closures. Even for those power plants repowered with natural gas, there will be job losses, because a coal-fired unit employs more personnel than a comparably sized natural-gas fired unit.[188] For the CPP alone, the Energy Information Administration (EIA) estimated severe job losses. By 2030, EIA forecasts that, if the CPP is implemented, there would be about *376,000 fewer non-farm jobs than if there were no CPP.*[189] The U.S. Chamber of Commerce, among many others, asked the Supreme Court to stay the CPP because of economic concerns, including localized issues in rural or economically distressed areas of the country. Its stay application included many declarations from potentially affected communities. For example, a

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[186] *Id.*

[187] TDD, Table 4-18 at 4-45.

[188] Buchsbaum, L., *Supporting Coal Power Plant Workers Through Plant Closures,* Power Magazine, June 1, 2016 (available at www.powermag.com/supporting-coal-power-plant-workers-plant-closures) (quoting AEP spokesperson that a "good-size" natural gas plant requires about 25 workers, as compared to 100-200 for a "good-size" coal-fired plant) (last visited March 18, 2017).

[189] Institute for 21st Century Energy, U.S. Chamber of Commerce, *EPA Clean Power Plan: EIA's Forecast Shows Benefits Fall Well Short of Costs ... Again* (June 2016) at 10, *citing* EIA, Annual Energy Outlook 2016.

school superintendent from Oliver County, North Dakota, described the likely impact to his District upon closure of one of two units at a nearby coal-fired station and the resulting 40% reduction in employment at a local coal mine. About 25% of the student population of the District are students whose families are dependent on the energy sector for their jobs, and the loss of those students would devastate the District:

> [T]he closure of the Coal Creek and Minnkota units and reduced production at the Falkirk Mine would result in significant financial harm to the District. One of the most important sources of income for the District is local property taxes. As families move away in response to the closures and reduced production at the mine, the size of the tax base will shrink, thus cutting funding for the District. Our local taxable evaluation will decrease with flooding of houses on the market and the lack of prospective home buyers .... This loss of funding would force the District to lay off staff, cut vital programs, or both.[190]

The business manager for a local chapter of the International Brotherhood of Boilermakers also submitted a declaration in support of the U.S. Chamber of Commerce's application for stay. He predicted that one station's closure would cost the local's members over $8,000,000 in wages and benefits in 2016 and the

[190] Declaration of Curtis Pierce, District Superintendent, Center-Stanton Public School District, Exhibit 7-H to U.S. Chamber of Commerce's Application for Immediate Stay of Final Agency Action Pending Appellate Review, para. 10 at 4, *West Virginia v. EPA*, No. 15-A-787 (Sup. Ct. Jan. 27, 2016).

closure of one of two units at another facility would mean the loss of $13-14,000,000 in wages and benefits.[191]

The ELG Rule's costs contribute to the threat of job losses, particularly when it is added on top of the impacts of other rules. The right course, therefore, is to reconsider the ELG Rule and its impacts on the economy as a whole and on local communities.

B. Lack of Coordination Among the Rules Causes Economic Inefficiencies and Uncertainties

EPA purported to analyze the impact of the final CCR rule and the proposed CPP rule on the ELG Rule. EPA agreed that the CPP was a major new rule affecting the same plants targeted by the ELG Rule; that is why EPA conducted its analysis. But it did not release its CPP analysis for public comment, and thus the industry had no way of evaluating it during the ELG rulemaking.

Had EPA's analysis of the CPP been released for comment, the industry would have demonstrated to EPA that the Final Rule's deadlines should be synchronized with the CPP's, to avoid unnecessary waste of resources and compliance costs. As issued, the Rule specifies that the new limits become

[191] Declaration of Luke Voigt, Business Manager, International Brotherhood of Boilermakers Local 647, Exhibit 7-C to U.S. Chamber of Commerce's Application for Immediate Stay of Final Agency Action Pending Appellate Review, paras. 8 and 10 at 4, 5, *West Virginia v. EPA*, No. 15-A-787 (Sup. Ct. Jan. 27, 2016).

applicable "as soon as possible."[192] Although permitting authorities have discretion to consider the CPP in deciding what constitutes "as soon as possible" for a given facility,[193] industry is experiencing wide variations in applicability dates. In any event, the ELG Rule requires application of the new limits "no later than" December 31, 2023. Consequently, the Rule's deadlines are inconsistent with the CPP's requirements to achieve greenhouse gas performance rates between 2022 and 2030.[194]

Competing deadlines will necessarily have an impact on EPA's analysis of the respective costs of the rules. More importantly, competing deadlines increase uncertainty for the industry members attempting to comply. And these uncertainties and complications increase costs, as industry struggles to harmonize its decisions on all of the pending rules at once.

A similar lack of harmony exists between the CCR rule and the ELG Rule. As a part of the CCR rule litigation,[195] EPA sought and was granted voluntary remand of portions of the rule.[196] Two of the remanded provisions have significant

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[192] *See, e.g.*, 80 Fed. Reg. at 67,894-95 (to be codified at 40 C.F.R. § 423.13(g)(1)(i)) (requiring compliance with the new FGD wastewater limits "as soon as possible beginning November 1, 2018, but no later than December 31, 2023").

[193] *See id.* at 67,894 (to be codified at 40 C.F.R. § 423.11(t)(2)(ii)).

[194] 80 Fed. Reg. at 64,664.

[195] *Utility Solid Waste Activities Group ("USWAG") v. EPA,* No. 15-1219 (D.C. Cir. filed July 15, 2015).

[196] Order, *USWAG v. EPA* (June 14, 2016), ECF No. 1619358.

consequences for discharges from ponds governed by the ELG Rule. Under those provisions (40 C.F.R. § 257.103(a) and 40 C.F.R. § 257.103(b)), a facility required to cease sending CCRs to a pond has to begin closing the pond within 30 days after ceasing its use for CCR waste.[197] But many industry ponds are used for both CCR and non-CCR wastewater. Therefore, EPA remanded these provisions so that it could consider whether to extend the CCR rule's alternative closure provisions to ponds that cease receiving CCR wastes but continue receiving non-CCR wastewater.[198]

EPA's decision on this point is critical to management of many existing ponds. If those ponds need to cease receiving both CCR and non-CCR wastewaters, many industry facilities will have to develop whole new wastewater management systems, and in many cases that involves rethinking the entire water balance and wastewater characteristics for each wastestream. If a pond may have to cease receiving non-CCR wastewater as a result of the CCR rule, then it makes no sense to retrofit treatment systems for purposes of the ELG Rule without considering that impact. It is inefficient in the extreme to undertake enormous system retrofits for purposes of the ELG Rule, and then have to rethink those retrofits – at considerable expense and system down-time – when EPA acts on the

[197] *See* 40 C.F.R. § 257.102(e).

[198] Respondent EPA's Unopposed Motion For Voluntary Remand of Specific Regulatory Provisions, Section II.E at 8-9, *USWAG v. EPA* (Apr. 18, 2016), ECF No. 1609250.

remanded CCR provisions. Through reconsideration of the ELG Rule and an administrative stay, these inefficiencies caused by the mandates of multiple rules can be addressed.

C. <u>The Changed Status of the CPP and the CCR Rule Warrants Reconsideration of EPA's Cost Analysis</u>

Even if EPA's analyses of the CPP and CCR impacts on the ELG Rule were accurate when the ELG Rule was finalized (and they were not), they cannot be accurate now. For the ELG Rule, EPA developed two separate economic analyses: one including the CCR rule, and one including both the CCR rule and the CPP. Given recent developments, analyzing the ELG Rule's impacts to industry and society through the lens of the CPP and CCR rules as finalized is inappropriate.

In February 2016, the Supreme Court stayed the CPP rule pending the outcome of judicial challenges.[199] Moreover, the President appears poised to issue an executive order requiring EPA to reconsider and potentially repeal the CPP.[200] These new circumstances provide strong reason to reconsider EPA's cost analysis for the ELG Rule. That analysis assumed unit closures or retrofits to gas caused by the CPP according to the CPP's original schedule. But, because of the stay, CPP

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[199] Order, *Chamber of Commerce v. EPA*, No. 15-A-787 (Sup. Ct. Feb. 9, 2016).

[200] *The Clean Power Plan is gone – and there's no 'replace',* E&E News (Mar. 9, 2017), available at http:/www.eenews.net/stories/1060051196 (last visited March 9, 2017).

implementation – if it occurs at all – could be years behind schedule. As a result, the true cost implications of the ELG Rule are not reflected in any EPA analysis.

As already described, the CCR rule also is being challenged in court,[201] and EPA has been granted a voluntary remand of portions of the rule. The remaining litigation issues could be decided by the court, possibly by the end of this year. Additionally, Congress recently enacted legislation that affected a major change in the CCR rule implementation.[202] The legislation allows states to assume responsibility for overseeing CCR rule implementation within their jurisdictions. Thus, substantial changes also may occur with the CCR rule.

Given the extreme uncertainties that were not present when EPA analyzed the cost impacts of these rules on the ELG Rule, it is incumbent upon EPA to reconsider the true costs of the ELG Rule and provide its analysis to the public for proper review and comment.

REQUEST FOR IMMEDIATE AGENCY ACTION TO SUSPEND OR DELAY COMPLIANCE DEADLINES

UWAG hereby requests an administrative stay pursuant to 5 U.S.C. § 705. When judicial review is pending and when "justice so requires," this section

[201] *USWAG v. EPA.*

[202] Water Infrastructure Improvements for the Nation Act, Pub. L. 114-322, Sec. 2301 (amending § 4005 of the Solid Waste Disposal Act (42 U.S.C. § 6945) to allow state programs for control of coal combustion residuals).

confers discretion upon an agency to "postpone the effective date of action taken by it." *Id.* For all the reasons above, justice dictates a stay here.

In addition, EPA should take all other administrative actions that may be necessary to assure the immediate suspension or delay of the Rule's fast-approaching compliance deadlines while EPA works to reconsider and revise, as appropriate, the substantive requirements of the current Rule pursuant to notice and comment rulemaking.[203] Notably, there are many options available for EPA to suspend or extend the compliance deadlines in order to preserve the status quo and avoid irreparable harm pending the completion of the reconsideration proceeding.[204]

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[203] Suspending the deadlines for indirect dischargers, among others, is particularly critical because they face a hard deadline of November 1, 2018, to meet the PSES/PSNS standards for several wastestreams. Accordingly, those dischargers are in the process now of making costly decisions that may be greatly affected by reconsideration.

[204] These options for EPA action include the following: (1) fast-tracked issuance of a new rule that rescinds or extends the compliance deadlines through an expedited notice and comment rulemaking, *see, e.g.*, National Emissions Standards for Hazardous Air Pollutants for Stationary Combustion Turbines; Final Rule; Stay, 69 Fed. Reg. 51,184 (Aug. 18, 2004) (pausing effective dates of a rule on the basis that the agency was in the process of amending the underlying rule); (2) prompt issuance of an interim final rule without notice and comment under the "good cause" exemption set forth in the APA at 5 U.S.C. § 553(b)(3)(B), *see* Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities; Interim Final Rule, 68 Fed. Reg. 1348 (Jan. 9, 2003) (postponing requirements that had gone into effect in August 2002 without notice and comment under the good cause exemption on the basis of impending deadlines that would no longer be appropriate once EPA finished revising the underlying rule); and (3) the prompt issuance of informal EPA guidance confirming that permitting authorities have broad discretion to set compliance deadlines under the Rule spanning the *entire* compliance window based on the four factors enumerated in 40 C.F.R. § 423.11(t) and are not obligated to impose a compliance deadline based on the initial deadline of November 1, 2018, due, in part, to EPA's decision to reconsider the substantive requirements of the Rule.

CONCLUSION

For all the foregoing reasons, EPA should grant this Petition, stay the Final ELG Rule and/or take other action to suspend the Rule's existing compliance deadlines, and promptly undertake to initiate a new rulemaking.

Dated: March 24, 2017

UTILITY WATER ACT GROUP

By ______________________________
Counsel

Kristy A. N. Bulleit
Hunton &Williams LLP
2200 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-1709
202-955-1547 (tel.)
kbulleit@hunton.com

Harry M. Johnson, III
Elizabeth E. Aldridge
Hunton &Williams LLP
Riverfront Plaza, East Tower
951 East Byrd Street
Richmond, VA 23219-4074
804-788-8200 (tel.)
pjohnson@hunton.com
ealdridge@hunton.com

To: Dravis, Samantha[dravis.samantha@epa.gov]; Kreutzer, David[kreutzer.david@epa.gov]; Brown, Byron[brown.byron@epa.gov]; Sugiyama, George[sugiyama.george@epa.gov]
From: Bromberg, Kevin L.
Sent: Fri 3/24/2017 9:13:30 PM
Subject: Steam Electric Utility (Water Pollution - predominantly Coal Fired Powerplants) Petition for Reconsideration
removed.txt
Letter to EPA Submitting Petition for Reconsideration w_exhibits-c-c-c.pdf

Not sure who should be reviewing this. This is a petition for rulemaking from UWAG and Southwestern Electtric Power, the two industry litigants.

This is an excellent opportunity for cost savings. The more immediate issue is the need for a stay of the compliance dates, particularly for indirect dischargers.

Who will be handling water issues in the short term?

Kevin

From: Potter, Barbara [mailto:bpotter@hunton.com]
Sent: Friday, March 24, 2017 2:25 PM
To: Bromberg, Kevin L.
Cc: Johnson, Harry M. ("Pete"); Bulleit, Kristy; Aldridge, Elizabeth
Subject: Petition for Reconsideration

Mr. Bromberg, per Kristy Bulleit's request, attached is the Utility Water Act Group's Petition for Reconsideration of EPA's Final Rule for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, which has been e-mailed to EPA Administrator Pruitt today.

Barbara Potter

Administrative Law Specialist

p 804.788.8247
f 804.788.8218

Hunton & Williams LLP
Riverfront Plaza, East Tower
951 East Byrd Street
Richmond, VA 23219

hunton.com

Contact:
Joel Ivy
General Manager, Lakeland Electric
Municipal Utility in Lakeland, Florida
Joel.Ivy@LakelandElectric.com
863-834-6541

ISSUE:
Effluent Limitation Guidelines (ELGs) for Steam Electric Power Generating Regulation
ELG rule, 40 CFR 423, was published at 80 FR 67837-67903 (November 3, 2015) and became effective January 4, 2016.

RESPONSIBLE AGENCY:
United States Environmental Protection Agency (EPA)

IMMEDIATE ACTION REQUESTED:
Issuance of immediate guidance to all states requiring **an extension of the ELGs deadline** for indirect and direct dischargers to enable newly appointed EPA staff sufficient time **to evaluate the validity and impact of this substantial regulation.**

THE PROBLEM: The ELG rule imposes excessively harsh discharge water requirements for all power plants. The new ELG standards are more stringent than those currently in place for drinking water. To avoid unnecessary waste of resources and compliance costs, a temporary stay is necessary. If the requirements for ELG are not revised, many electric generating units, which were not part of the EPA baseline study, may be forced to cease operation resulting in higher **electric rates to customers and loss of employment**.

SPECIFICS: As an example, consider Lakeland Electric (LE), a municipal utility in Lakeland, Florida with an active coal-fired power plant, McIntosh Power Plant (MPP) Unit 3, that is an **indirect discharger** with an estimated \$6 to \$10 million cost to comply with the ELG rule.

- **Unnecessary Additional Compliance –** MPP Unit 3 wastewater is treated onsite in accordance with the discharge permit issued by the Publicly-Owned Treatment Works (POTW) before being discharged. The POTW then routes the wastewater through a staged wetland treatment system and carefully monitors the water quality before discharging to the environment in accordance with its NPDES permit. All surface water quality requirements are already consistently met.
- **Biased compliance schedule** – *Indirect dischargers must be compliant by November 1, 2018*. However, direct dischargers have until December 2023 to attain compliance. Both direct and indirect dischargers should have same compliance schedule in a revised rule.
- **Environmental Impact** – The impact occurs at the POTW's discharge point and from plants that directly discharge to the environment. ELG should not impose harsh treatment standards on indirect dischargers because the plants are not discharging to environment. POTW provides additional treatment, is accountable for water quality at its discharge point, and has authority to regulate upstream discharges into its system in order to insure downstream compliance (environmental impact).
- **Excessive Quality Thresholds –** ELG rule is an industrial wastewater standard that requires drinking water quality standards thereby causing LE to immediately spend \$6-\$10 million to comply.

Contaminant	Drinking Water Limit Mg/L	ELG 1 Day Limit Mg/L	ELG 30 Day Limit Mg/L
Mercury	0.002	0.000788	0.000356
Arsenic	0.01	0.011	0.008
Nitrate/Nitrite as Nitrogen	10	17	4.4
Selenium	0.05	0.023	0.012

WATER

Steam Electric Power Generating Effluent Limitations Guidelines and Standards

I) Regulation

The Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category ("ELG Rule"), which was promulgated pursuant to a settlement agreement with environmental organizations and finalized in Nov. 2015, sets novel, stringent limits on wastewater discharges from power plants under the Clean Water Act. Specifically, the rule imposes new design criteria and numeric limits directly applicable to hundreds of existing coal-fired power generating facilities, as well as even more burdensome standards for new sources.

II) Problems with the Regulation

The ELG Rule imposes excessive compliance costs and regulatory burdens on utilities, which will have serious ramifications on both the utility and coal industries and the large and small businesses that rely on them. In promulgating the ELG Rule, the Environmental Protection Agency (EPA) relied on limited and obsolete data, and withheld much of the fundamental information upon which it relied. As a result, the ELG Rule imposes requirements under a "best available technology economically achievable" standard that are not, in fact, available, feasible or economically achievable. Furthermore, many of the assumptions made in the ELG Rule were based on EPA's Clean Power Plan (CPP) and Coal Combustion Residuals (CCR) Rule, both of which are likely to undergo significant changes which will undoubtedly impact many of the premises upon which the ELG Rule was based.

According to the utility industry, the ELG Rule will force plant closures and lead in many instances to compliance costs in the hundreds of millions of dollars *per effected company*. For example, Dynegy has estimated costs associated with the ELG Rule at $308 million, MRG anticipates costs of approximately $200 million, and AEP has projected costs ranging from $400-550 million through 2023. When combined with the CPP and CCR Rule, the cumulative impacts to coal-fired electric generation are staggering.

III) E.O. 13771 and E.O. 13777 Criteria

The ELG Rule is a strong candidate for revision under Executive Order 13771 of January 30, 2017 (Reducing Regulation and Controlling Regulatory Costs), and Executive Order 13777 of February 24, 2017 (Enforcing the Regulatory Reform Agenda). Specifically, the ELG Rule (1) eliminates jobs and inhibits job creation; (2)

imposes costs that exceed its benefits; (3) relies in part on data, information, and methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility; (4) places undue burden on the development and use of domestic energy resources; and (5) offers opportunities for reduction in regulatory costs. Furthermore, review under the relevant E.O.s would allow the Administration the opportunity to comprehensively address the cumulative impacts of the ELG Rule, CPP, and CCR Rule to the coal mining and utility industries. The ELG Rule was based on unsound and, in many cases, undisclosed data, imposes overly stringent limitations not supported by scientific or economic realities, and will lead to excessive compliance costs and the closure of coal-fired power plants.

To: Nolan, Rich[RNolan@nma.org]
From: Jackson, Ryan
Sent: Sat 4/15/2017 10:42:11 PM
Subject: FW: EPA to Reconsider ELG Rule

FR notice Tuesday

From: Bowman, Liz
Sent: Thursday, April 13, 2017 5:59 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: EPA to Reconsider ELG Rule

CONTACT:
press@epa.gov

FOR IMMEDIATE RELEASE
April 13, 2017

EPA to Reconsider ELG Rule

EPA takes another action to implement President Trump's vision

WASHINGTON – EPA announced the agency's decision to review and reconsider the final rule that amends the effluent limitations guidelines and standards for the steam electric power generating category under the Clean Water Act (ELG Rule), which has been estimated to cost $480 million per year and has a reported average cost of $1.2 billion per year during the first five years of compliance.

"This action is another example of EPA implementing President Trump's vision of being good stewards of our natural resources, while not developing regulations that hurt our economy and kill jobs," said EPA Administrator Scott Pruitt.

EPA issued an administrative stay to delay the compliance deadlines for the ELG Rule during the pendency of the ongoing litigation challenging the rule in order to give the agency the opportunity to consider and review the rule. EPA will also be sending a letter to the petitioners who requested reconsideration of the rule, to notify them that the rule has been administratively stayed and is under review.

"Some of our nation's largest job producers have objected to this rule, saying the requirements set by the Obama administration are not economically or technologically feasible within the proscribed time frame. It is in the public's best interest to reconsider the rule and assess the wide-ranging and sweeping objections that the agency received," said Administrator Pruitt.

R058

600 North 18th Street
14N-8195
Birmingham, AL 35203

May 15, 2017

Samantha K. Dravis
Regulatory Reform Officer and
Associate Administrator, Office of Policy
U.S. Environmental Protection Agency
Mail Code 1803A
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

Submitted Electronically via Regulations.gov

Southern Company's Response to EPA's Request for Comments on Evaluation of Existing Regulations Pursuant to Executive Order 13777, 82 Fed. Reg. 17,793 (Apr. 13, 2017): Docket ID No. EPA-HQ-OA-2017-0190

Dear Ms. Dravis:

Southern Company appreciates the opportunity to offer comments in response to the Environmental Protection Agency's ("EPA" or "Agency") April 13, 2017, Federal Register notice[1] seeking public input to assist the Agency's evaluation of existing regulations pursuant to Executive Order 13777 ("Executive Order" or "Order").[2] These comments are submitted on behalf of Southern Company and each of its following subsidiaries—Alabama Power, Georgia Power, Gulf Power, Mississippi Power, PowerSecure, Southern Company Gas, and Southern Power. Southern Company is also a member of the Utility Air Regulatory Group ("UARG"), Utility Solid Waste Activities Group ("USWAG"), Utility Water Act Group ("UWAG") and the Edison Electric Institute ("EEI"), and fully supports and adopts the comments submitted by those associations. Southern Company's comments supplement those filed by the above associations.

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[1] 82 Fed. Reg. 17,793 (Apr. 13, 2017).
[2] Exec. Order 13777, 82 Fed. Reg. 12,285 (Mar. 1, 2017).

Southern Company is America's premier energy company, with 46,000 megawatts of generating capacity and 1,500 billion cubic feet of combined natural gas use and throughput volume serving 9 million electric and gas utility customers through its subsidiaries. The company provides clean, safe, reliable and affordable energy through electric utilities in four states, natural gas distribution utilities in seven states, a wholesale generation company serving customers across America, and a nationally recognized provider of customized energy solutions. Through an industry-leading commitment to innovation, Southern Company and its subsidiaries are inventing America's energy future by developing the full portfolio of energy solutions—including nuclear energy, 21st-century coal technologies, natural gas, renewable energy resources and energy efficiency—and creating new products and services for the benefit of customers. We are committed to meeting our customers' energy needs today and bringing customers energy solutions that will drive growth and prosperity tomorrow.

Southern Company believes that responsible environmental regulation is consistent with economic growth and the continued production of reliable and affordable energy. As our industry adapts to a continually changing future, Southern Company's commitment to reduce our impact on the environment is demonstrated by our environmental stewardship activities, our efforts to protect valuable natural resources while serving our customers and our compliance with applicable environmental regulations. We believe that sound government policies are essential to ensure energy is generated, transmitted, and sold in a way that is clean, safe, reliable and affordable. Further, policies designed to promote any of these goals individually should not impede the ability to optimally balance the collective goals—clean, safe, reliable and affordable. Moreover, environmental policies must consider other federal and state laws and regulation that, over time, established federal and state energy policy as it affects electric and gas utilities. Environmental regulation must effectively co-exist with

other federal and state statutory and regulatory schemes that affect the industries being regulated and respect the relevant jurisdictional roles and responsibilities under those laws and regulations. In some instances, environmental regulations adopted without this holistic approach can constrain economic growth, impose unnecessary costs on those who can least afford it, and confuse jurisdictional boundaries. Fortunately, there are ways to formulate environmental policies that continue to protect the environment while alleviating the potential for substantial economic harm to the American people—for example, adopting policies that align with technological advancement and innovation that support safe, reliable and affordable energy.

Southern Company therefore supports the policy established by the Executive Order of "alleviat[ing] unnecessary regulatory burdens placed on the American people."[3] To carry out this policy, the Order directs agencies (including EPA) to review their existing rules and identify those that may be appropriate for "repeal, replacement, or modification."[4] In particular, the Executive Order directs agencies to identify those existing regulations that, among other things:

- eliminate jobs or inhibit job creation;
- are outdated, unnecessary, or ineffective;
- impose costs that exceed benefits; or
- rely in whole or in part on data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard of reproducibility.[5]

As EPA undertakes its review and any subsequent actions, Southern Company's main objective is to ensure that environmental regulations promote—rather than hinder—the generation, transmission, and sale of energy in a way that is not only clean, but also safe, reliable, and affordable. A variety of environmental regulations can be improved to achieve this balance and ensure environmental protection while also reducing the burdens imposed on the American people and the economy. As part of this

[3] *Id.* § 1.
[4] *Id.* § 3(d).
[5] *Id.* The Executive Order also directs agencies to consider two other factors which are not addressed in these comments.

review, we encourage the Agency to consider the following fundamental principles and ensure they are reflected in subsequent actions:

- **Constructive regulation**: Regulations should provide constructive solutions to real problems affecting people, the environment, and the economy. The Agency should avoid imposing requirements that are duplicative, not supported by sound data and analysis, or otherwise unduly burdensome. In evaluating potential regulations, the Agency should take into consideration other statutes and regulations, both federal and state, that will affect the implementation and impacts of the potential regulation.

- **Regulatory certainty**: For many regulated industries, including our industry, regulatory certainty is essential to inform the long-term business planning and substantial capital investments required to effectively operate today and plan for tomorrow. Southern Company values clear, predictable requirements and consistent application of the law. Regulatory uncertainty can impose significant costs on the American people with minimal or no tangible benefits.

- **Cooperative federalism**: Regulation is most effective when the federal government works in partnership with the states rather than imposing one-size-fits-all federal regulations. This is particularly true in environmental regulation, where Congress has explicitly recognized the primary role of states.[6] Agencies should defer to the states with regard to matters for which the states have traditionally been delegated authority.

- **Realistic assessments of costs and benefits**: Analyses of proposed or existing regulations must properly weigh the relevant costs and benefits imposed by those rules. When evaluating costs and benefits, EPA should avoid reliance on speculative or scientifically unproven benefits and use sound, commonly accepted methods to make predictions about future costs and benefits.

- **Realistic technology-based standards**: The Agency should not adopt standards based on unsupported conclusions or on unproven, unreliable, or excessively costly technologies. Requiring sources to implement technologies that are unproven or not commercially available can actually hinder further technological development.

With these principles in mind, Southern Company supports EPA's efforts to review its existing regulations pursuant to the Executive Order and offers the following comments on EPA's existing regulations. In our comments, we discuss ways in which some of EPA's existing regulations relate to

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[6] *E.g.*, Clean Air Act ("CAA") § 101(a)(3) (stating that "air pollution prevention … and air pollution control at its source is the primary responsibility of States and local governments"); Clean Water Act ("CWA") § 101(b) ("It is the policy of the Congress to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution, to plan the development and use … of land and water resources...").

the criteria specified in the Order. These comments provide examples of rules that embody the concerns outlined in the Executive Order and are not an exhaustive list of the regulations that Southern Company believes are appropriate for review. Further examples of specific regulations that EPA should examine pursuant to the Executive Order are described in greater detail in the comments of UARG, USWAG, UWAG and EEI.

We encourage the Agency to take its next steps quickly but carefully in order to minimize the regulatory uncertainty that may result in the near term. Simple but thoughtful changes can improve rules significantly in a way that minimizes disruption to long-term business planning and ongoing construction and compliance activities.

I. EPA Should Review Regulations Establishing Impractical or Unachievable Standards, Including Standards Not Based on Sound Data and Analysis, Adequately Demonstrated Control Technologies or Not Developed in a Transparent Manner.

EPA should ensure that its regulatory requirements are: based on the use of commercially available and reliable control technologies; achievable for individual sources; and developed in a transparent manner using high-quality, publicly available data. Facility owners cannot make plans to comply with standards if they do not have the tools to do so, and the public cannot meaningfully participate in the rulemaking process if the public cannot analyze the data or the methodologies used to adopt standards.

In the 2015 **Effluent Limitations Guidelines ("ELG") Rule**[7] for steam electric power generating sources, shortcomings in the data EPA relied upon—much of which was not disclosed—led the Agency to adopt standards that sources cannot consistently achieve using available technology.[8] For example, the rule's designated "best available technology" ("BAT") for treating scrubber

[7] 80 Fed. Reg. 67,838 (Nov. 3, 2015).
[8] Southern Company filed extensive comments on EPA's proposed ELGs. *See* Comments of Southern Company on Proposed ELGs (Sept. 19, 2013), Doc. No. EPA-HQ-OW-2009-0819-4379.

wastewater continues to remain unreliable as a means to consistently achieve compliance. EPA's decisions on major portions of the ELG Rule are based on flawed data or misinterpretations of data. Because EPA did not make all of the data, methodologies, and analyses used to support its conclusions—including its BAT determination for scrubber wastewater—available to the public, the ELGs are inconsistent with the policies laid out in the Executive Order, which cautions against relying on data that are not transparent or reproducible.[9] The ELGs should be modified to set practical and achievable standards and the public should have the opportunity to fully review the data and methodologies used to help determine the corrections that may be needed.

The **Clean Power Plan's**[10] carbon dioxide ("CO_2") emission guidelines for existing power plants are also fundamentally flawed because they are not based on emission control technologies at all.[11] In that rule, EPA took the unprecedented step of basing its emission reduction targets on shifting energy generation from coal-fired to gas-fired sources and from all fossil fuel-fired sources to renewable sources—rather than on emission controls that are available to the source itself. As a result, the Clean Power Plan's emission guidelines are overly stringent. This is inconsistent with the Clean Air Act ("CAA") and four decades of EPA rulemakings under section 111 of the CAA. As EPA undertakes its review of the Clean Power Plan pursuant to Executive Order 13783, Southern Company encourages the Agency to reaffirm the longstanding principle that standards of performance must be achievable based on available control technologies at the source.

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[9] Exec. Order 13777 § 3(d)(v).
[10] 80 Fed. Reg. 64,662 (Oct. 23, 2015).
[11] Southern Company filed extensive comments on the proposed Clean Power Plan. *See* Comments of Southern Company on Proposed Clean Power Plan (Dec. 1, 2014), Doc. No. EPA-HQ-OAR-2013-062-22907.

Furthermore, the finalized **CO_2 New Source Performance Standards ("CO_2 NSPS")**[12] for new coal-fired electric generating units ("EGUs") were based on carbon capture and storage ("CCS") as the best system of emission reduction "adequately demonstrated;" however, EPA provided no evidence that CCS was completely installed and demonstrated at any commercial-scale EGU.[13] As an industry leader in the development of CCS through implementation of pilot projects and the development of the Department of Energy-funded Kemper County Energy Facility, Southern Company is uniquely positioned to comment on the status of CCS. And, while the commercial operation of the Kemper County Energy Facility will mark a significant technological milestone for CCS, it will only be a first step in the integration of one type of carbon capture technology with a specific generation technology. Experiences gained from the Kemper County Energy Facility, as well as many more fully-integrated applications of CCS on full-scale power plants, will be needed before the technology can be considered "adequately demonstrated." While Southern Company is optimistic that CCS may play a larger role in capturing CO_2 in the future, application of the suite of technologies required in an integrated CCS system has not yet been "adequately demonstrated" on any commercial-scale EGU, as is required before establishing a nationally applicable NSPS for new EGUs. As a result, Southern Company supports EPA's ongoing review of the CO_2 NSPS and encourages the Agency to establish EGU performance standards based on "adequately demonstrated" control technologies.

Additionally, EPA's recent **Cross-State Air Pollution Update Rule ("CSAPR Update Rule")**[14] that establishes revised emission budgets for power plants results in unnecessary over-control

[12] 80 Fed. Reg. 64,510 (Oct. 23, 2015).
[13] Southern Company filed extensive comments on the proposed CO_2 NSPS. *See* Comments of Southern Company on Proposed CO_2 NSPS (May 9, 2014), Doc. No. EPA-HQ-OAR-2013-0495-10101.
[14] 81 Fed. Reg. 74,504 (Oct. 26, 2016).

of upwind emissions.[15] In addition to improperly imposing state emission budgets on power plants from the top down, the rule requires emission reductions from power plants in upwind states that are severely disproportionate to the limited projected reductions in downwind ozone concentrations. The vast discrepancy between required reductions and expected benefits are not sensible and are not justified by any data or analysis in the record. EPA should revise its "substantial contribution" screening methodology to conform with a common sense analysis of the data in the record. EPA should also focus its approach to addressing non-attainment issues by cooperating with states on local efforts to improve air quality and on ensuring emissions reduction requirements from upwind states actually have the potential for material, data-supported impacts on downwind ozone concentrations.

II. EPA Should Review Regulations That Are Outdated, Unnecessary, or Ineffective, Including Those That Interfere with Cooperative Federalism, Minimize State Authority, Conflict with Other Federal Statutory Schemes, Or Do Not Properly Account For Regional Differences.

Southern Company agrees that EPA should take action to address regulations that are outdated, unnecessary, or ineffective.[16] In particular, regulations may be unnecessary and ineffective if they conflict with the principle of cooperative federalism, or if they impose monitoring, recordkeeping or reporting requirements that are duplicative, costly, or add little value. Congress envisioned a primary role for states in protecting the environment, and federal policies that interfere with that role can lead to inefficiencies and hinder states' efforts to account for important regional and intrastate differences.

For example, EPA's 2015 **Coal Combustion Residuals ("CCR") Rule**[17] fails to provide an appropriate role for state and local permitting agencies to manage coal combustion residuals.[18] In the

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[15] Southern Company filed detailed comments on the proposed CSAPR Update Rule. *See* Comments of Southern Company on Proposed CSAPR Update Rule (Feb. 1, 2016), Doc. No. EPA-HQ-OAR-2015-0500-0290.
[16] Exec. Order 13777 § 3(d)(ii).
[17] 80 Fed. Reg. 21,302 (Apr. 17, 2015).

final CCR Rule, EPA removed provisions from the proposal that would have allowed for tailoring of the rule's groundwater monitoring and corrective action programs based on site-specific conditions, claiming there was no regulatory body that could oversee implementation of the rule. As a result, the final rule eliminated the proposal's cost-effective, site-specific, and environmentally protective options for managing CCRs. Instead, the final rule included overly stringent and costly compliance requirements imposed through a self-implementing compliance scheme where citizen suits were the primary enforcement mechanism. The lack of site-specific risk-based considerations, a provision that is contained in other EPA (and state) programs, is imposing tremendous costs with no additional protection of human health and the environment. However, the Water Infrastructure Improvements for the Nation Act of 2016 ("WIIN Act") passed by Congress in December 2016 expressly recognizes the critical role of states in regulating CCRs, and provides that states and EPA now have the authority to implement the CCR rule through a permit program, which can remove concerns of abuse from a self-implementing rule.[19] EPA should promptly review and modify the CCR Rule to allow for implementation through cooperative federalism as contemplated by the WIIN Act.

Another example of EPA action that conflicts with cooperative federalism occurred in 2015 when EPA called for 36 states to revise their SIPs regarding emissions during startup, shutdown, and malfunction ("SSM") events. In this action, known as the **SSM SIP Call**,[20] EPA claimed that the SIPs of over two-thirds of U.S. states are "substantially inadequate" to meet the CAA's requirements

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[18] Southern Company filed extensive comments on the proposed rule in November 2010. See Comments of Southern Company on Proposed Regulations for Coal Combustion Byproducts from Electric Utilities, (November 2010), Doc. No. EPA-HQ-RCRA-2009-0640.

[19] Water Infrastructure Improvements for the Nation Act, Pub. L. No. 114-322, 130 Stat. 1628 (Dec. 16, 2016).

[20] 80 Fed. Reg. 33,840 (June 12, 2015).

because they did not align with EPA's interpretation of how those events should be treated.[21] This EPA action forces states to reverse their own regulations—some of which have been in place for nearly four decades—without any evidence that the SSM provisions in question would actually affect attainment or maintenance of any National Ambient Air Quality Standards ("NAAQS"). EPA should, instead, recognize the fundamental federal-state partnership that Congress envisioned in the CAA, through which states retain discretion in crafting their SIPs as long as they ensure attainment and maintenance of the NAAQS within their own borders.

Likewise, under the Clean Water Act ("CWA"), EPA hindered cooperative federalism in its 2015 **Water Quality Standards Rule**.[22] Water quality standards under the CWA are the states' domain, with limited oversight from EPA. The Water Quality Standards Rule improperly encroaches on the states' role by limiting their flexibility in developing their water quality standards programs and subjecting them to greater federal oversight. As a result, the rule will unnecessarily impose additional costs and regulatory delays on industry with greater administrative burdens on federal and state resources. EPA should review the Water Quality Standards Rule to seek a constructive solution that correctly maintains the principles of cooperative federalism.

The **Clean Power Plan** is also inconsistent with cooperative federalism. The CAA explicitly grants states substantial discretion to adopt state plans implementing emission guidelines for existing sources, and allows the states to vary the requirements imposed on sources based on their consideration of the "remaining useful lives of the sources" and "other factors."[23] Yet the Clean Power Plan deprives states of that discretion by barring any variance from EPA's top-down emission reduction decrees.

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[21] Southern Company submitted extensive comments to this rule on May 13, 2013. *See* Comments of Southern Company on Proposed SSM SIP Call (May 13, 2013), Doc. No. EPA-HQ-OAR-2012-0322-0507.
[22] 80 Fed. Reg. 51,019 (Aug. 21, 2015).
[23] CAA § 111(d)(2).

Moreover, the Clean Power Plan's emission reduction requirements are based on shifting states' electric generation from coal- to gas-fired sources and from fossil fuel-fired to renewable sources, rather than on emission controls available to individual sources. This ignores the primary responsibility afforded to the states to determine the appropriate mix of energy resources within their borders.

EPA regulations should also be reviewed to ensure they are consistent with other federal statutory schemes, such as the Federal Power Act or the Natural Gas Act, and with regulation under those statutes. For example, the Clean Power Plan would have the effect of requiring changes in how electric utilities dispatch their power systems, a practice that has always been subject to regulation by the Federal Energy Regulatory Commission under the Federal Power Act. The EPA must ensure that when it issues regulations, those regulations are consistent with or complementary to other federal regulations.

Regulations are also unnecessary or ineffective if they impose monitoring, recordkeeping, or reporting requirements that are duplicative, costly, or add little value. For example, Southern Company disagrees with the Clean Power Plan's requirement that power plants that capture their CO_2 in order to meet an applicable emission limit must transfer the CO_2 to an offsite facility that "reports in accordance with the requirements of 40 CFR part 98 subpart RR."[24] This requirement conversely prevents states from giving emissions reduction credits to plants that transfer captured CO_2 to offsite facilities that report under Subpart UU, the regime used in enhanced oil recovery ("EOR"). EOR wells are already heavily-regulated by state oil and gas boards pursuant to underground injection control programs, as well as Subpart UU. The **Subpart RR reporting requirement** for CO_2 capture projects does not further promote the safe, permanent storage of captured CO_2 and would have significant economic or compliance impacts on facilities that have invested in carbon capture and storage technologies with

[24] 40 C.F.R. § 60.5860(f).

plans to transfer captured CO_2 to offsite EOR operations. Requiring CO_2 recipients to report under the more stringent provisions of Subpart RR disincentivizes future deployment of CCS technologies and is unnecessary.

III. EPA Should Review Regulations That Inordinately Impact the Economy or Fail to Adequately Compare Costs and Benefits.

Agency rulemaking must account for the costs that regulation imposes on society. Regulations that are unnecessarily costly harm the American public by raising the cost of operating facilities and contributing to potential premature facility retirements or closures, which can "eliminate jobs[] or inhibit job creation."[25] Likewise, constructive rulemaking requires the Agency to weigh the costs of regulation against the relevant benefits to ensure residents are made better off.[26]

For example, the Agency's decision to adopt the **Clean Power Plan** was based in part on a faulty cost-benefit analysis that reflected several fundamental flaws. Southern Company recognizes that climate change is a challenging issue for our world and our nation, and we are committed to a leadership role in finding solutions that make technological, environmental and economic sense. However, in the Clean Power Plan, EPA's cost-benefit analysis attempted to justify the projected costs by pointing to the expected incidental reductions in non-greenhouse gas emissions as justification for the enormous cost of the rule. Many non-greenhouse gas emissions are already specifically and extensively regulated by other statutory and regulatory provisions under the CAA. Relying on these incidental reductions yields benefit projections for the Clean Power Plan that are either double-counted, overstated, or both. Moreover, the Agency calculated *global* benefits rather than focusing on *domestic* benefits of the CO_2 emission reductions attributed to the Clean Power Plan. Under current White

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[25] Exec. Order 13777 § 3(d)(i).
[26] *See Michigan v. EPA*, 135 S. Ct. 2699 (2015); Exec. Order 13783 § 1(e), 82 Fed. Reg. 16,093 (Mar. 31, 2017) (stating "necessary and appropriate environmental regulations … are of greater benefit than cost").

House Office of Management and Budget ("OMB") guidelines, analysis of economically significant proposed and final regulations from the domestic perspective is required.[27] Appropriate regulatory cost-benefit analyses should focus on the benefits of reducing emissions of the pollutant that a regulation is actually targeting, and only on the domestic benefits of that action. Southern Company agrees with EPA's plan to review the Clean Power Plan in light of these issues and encourages the Agency to develop a durable and constructive solution.

EPA's **Mercury and Air Toxics Standards ("MATS") Rule**[28] is another example of a regulation that improperly counted the perceived benefits from reductions of emissions that are already regulated by other statutes. EPA's own estimates showed the benefit from mercury and air toxics emission reductions to be $4-6 million per year, while the cost of the rule is $9.6 billion per year.[29] Moreover, the Supreme Court decided that EPA did not properly weigh the costs and benefits of this regulation. The subsequent progression of the MATS Rule also illustrates the risks of regulatory uncertainty, with changes to the rule still being contemplated over five years after it went into effect. Meanwhile, Southern Company has already invested significant capital and resources into implementing and complying with the requirements of the MATS Rule. Based on our experience complying with the MATS Rule, it is clear that numerous opportunities exist to reduce that rule's ongoing costs: for example, by modifying or streamlining its monitoring, testing, reporting and recordkeeping provisions; by specifying that affected units are not subject to these burdensome and unnecessary requirements when they operate on natural gas; and by addressing provisions in the rule that are inconsistent or unclear. Southern Company encourages the Agency to optimize the MATS Rule's clarity, consistency and flexibility.

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[27] OMB, Circular A-4 at 34.
[28] 77 Fed. Reg. 9304 (Feb. 16, 2012).
[29] *Id.* at 9425, 9428.

Likewise, EPA's final **ELGs** for steam electric power generating sources are based on faulty cost-benefit analyses and should be reviewed pursuant to the Executive Order. In that rule, EPA concluded that the BAT for scrubber wastewater is the use of chemical precipitation plus biological treatment, despite the fact that the incremental costs of biological treatment far exceed the limited benefits of the additional pollutant removal that process would achieve. Southern Company supports EPA's ongoing review of the ELG in light of these issues.

Another example of policy that hinders economic growth is the Agency's implementation of the **New Source Review ("NSR")** preconstruction permitting program. The CAA requires both new power plants and existing plants that are "modified" to undergo NSR and obtain permits before construction or modification can begin. If triggered, NSR is extremely costly and time-consuming, and it presents a substantial hurdle for investment in new plants and improvements to existing plants. The theory of NSR liability that the Agency has pursued in enforcement cases against existing power plants has led to decades of litigation while yielding inconsistent judicial interpretations of the law. This inconsistency has led to compliance and enforcement uncertainty that impedes projects that could otherwise improve the reliability, efficiency and performance of these plants. Additional uncertainty surrounding costs and the availability of future generation has resulted. NSR reform can be achieved through changes in EPA's litigation position in enforcement cases, as well as through Agency guidance and regulations.

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Southern Company appreciates the opportunity to provide input on the Agency's review of existing regulations pursuant to Executive Order 13777. Southern Company believes that responsible environmental regulation need not impede economic growth or the continued production of reliable and affordable energy. We encourage EPA to take thoughtful, constructive steps to ensure that all of its

rules reflect the core principles fundamental to effective regulation: certainty and clarity; respect for the principle of cooperative federalism; meaningful consideration of both costs and benefits; and emphasis on scientifically and technically sound standards. If EPA remains mindful of these values, it can best serve the American people by optimally balancing environmental protection, safety, reliability, and affordability in the energy industry. If you have any questions regarding these comments please contact Jason Reynolds at 205.257.7181 and jakreyno@southernco.com or Scott Clouse at 205.257.6612 and sclouse@southernco.com.

Sincerely,

Jeffrey A. Burleson
Vice President
Environmental & System Planning

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
Cc: Shapiro, Mike[Shapiro.Mike@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Jordan, Ronald[Jordan.Ronald@epa.gov]; Ramach, Sean[Ramach.Sean@epa.gov]; kevin.bromberg@sba.gov[kevin.bromberg@sba.gov]; OW-Docket[OW-Docket@epa.gov]; Brown, Doug[Doug.Brown@cwlp.com]
From: Williams, Deborah J
Sent: Thur 5/11/2017 9:48:31 PM
Subject: EPA Docket ID No. EPA-HQ-OW-2009-0819
LTR to EPA-HQ-OW-2009-0819.pdf

Administrator Pruitt,

Please find the attached supporting documentation from the City of Springfield, Office of Public Utilities regarding reconsideration of the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (EPA Docket ID No. EPA-HQ-OW-2009-0819).

Sincerely,

Deborah J. Williams

Regulatory Affairs Director

City of Springfield Office of Public Utilities

800 E. Monroe, 4th Floor

Springfield, Illinois 62701

(217) 789-2116 ext. 2628

OFFICE OF PUBLIC UTILITIES
CITY OF SPRINGFIELD, ILLINOIS

JAMES O. LANGFELDER, MAYOR

May 11, 2017

Scott Pruitt, Administrator
Environmental Protection Agency
1200 Pennsylvania Ave, N.W.
Washington, D.C. 20460

Re: Effluent Limitations Guidelines and Standards for the Steam Electric Generating Point Source Category; Docket ID No. EPA-HQ-OW-2009-0819, Final Rule, 80 Fed. Reg. 67,837 (November 3, 2015)

Dear Administrator Pruitt,

I am writing as Chief Utility Engineer for the City of Springfield, Office of Public Utilities. The City of Springfield, Illinois owns and operates the small municipal utility referred to as City Water, Light and Power (CWLP) and provides electric power to its citizens, approximately 68,000 customers, the residents and commercial businesses of Springfield and surrounding areas. I am writing in with regard to the recently announced reconsideration of the Effluent Limitations Guidelines and Standards for the Steam Electric Generating Point Source Category rulemaking and in support of the regulatory petitions to reconsider and modify this rulemaking filed by the Utility Water Act Group and the Small Business Administration's Office of Advocacy. See, 82 Fed. Reg. 19005 (April 25, 2017).

Indirect dischargers like CWLP, subject to the pretreatment standards for existing sources, are disproportionately impacted by the ELG rule. Although EPA has not identified which individual utilities are subject to these requirements, CWLP believes that most, if not all, of the facilities impacted are also small publically owned utilities.

CWLP supports the efforts to reopen the ELG rule for reconsideration and hopes that EPA will seek a formal remand of the pretreatment standards for existing sources in 40 C.F.R. §423.16 from the Court of Appeals. In any reevaluation of the ELG rule, EPA should consider eliminating the pretreatment standard for existing sources from the rule due to the excessive costs imposed on indirect dischargers like CWLP and lack of environmental benefit. EPA should also consider exempting smaller facilities from certain additional discharge requirements of the ELG rule.

Please find attached our statement of the impact of these provisions on CWLP and its customers. Contact me at doug.brown@cwlp.com or 217-789-2116 ext. 2636 if you have any questions.

Sincerely,

Douglas A. Brown

Douglas A. Brown, P.E.
Chief Utility Engineer

Effluent Limitations Guidelines and Standards for the Steam Electric Generating Point Source Category
Final Rule, 80 Fed. Reg. 67,837 (November 3, 2015)

STATEMENT OF IMPACT ON CITY OF SPRINGFIELD ILLINOIS
and in support of petitions to reconsider of Utility Water Act Group and Small Business Administration, Office of Advocacy
Docket ID No. EPA-HQ-OW-2009-0819

The City of Springfield, Illinois owns and operates the small municipal utility referred to as City Water, Light and Power (CWLP) and provides electric power to its citizens, approximately 68,000 customers, the residents and commercial businesses of Springfield and surrounding areas.

Springfield provided comments on the proposed Effluent Limitations Guidelines and Standards for the Steam Electric Generating Point Source Category ("ELG") rule, but the final rule was published with significant changes from the original proposal that did not take into account these comments and, in fact, created new obstacles and financial burdens. The ELG's pretreatment standards for FGDS wastewater from existing sources (PSES) are unnecessarily stringent and costly, provide no environmental benefit—as it relates to CWLP—and have an impractical deadline to achieve.

CWLP currently operates four coal-combustion units that utilize Illinois coal; three of these were placed into service in 1968, 1972 and 1978, and a fourth went online in 2009. While many smaller units in the country have been targeted for closure, CWLP has maintained a continuous commitment to plant maintenance and an aggressive program of plant investment to assure the most efficient combustion of fuel economically justified while maintaining current emissions control requirements. As a result, these plants are cost effective and clean units that have substantial remaining economic value. In 2009, CWLP began commercial operation of a new coal-fired unit, Dallman Unit 4, replacing its Lakeside units, which lacked modern pollution controls. Dallman Unit 4 won accolades from engineering and environmental groups alike. It was constructed with a dry ash handling system, and has some of the most advanced air pollution controls of any power plant in the country.

Although EPA visited CWLP's electric generation facilities in developing the technology standards for the ELG rule and complimented CWLP on its progressive approach to pretreating the wastewater stream from its scrubbers (FGDS wastewater), under the final ELG rule this progressive approach still will not achieve compliance with the PSES. Prior to adoption of the ELG rule, CWLP installed an on-site treatment facility in 2009 for $15 million. After on-site treatment, the FGDS wastewater is sent for additional treatment to the local publically operated treatment works (POTW) at a cost of $1.5 million per year.

It is believed that CWLP is one of only six utilities in the country who send their FGDS wastewater to a POTW and one of just three that have a pretreatment system for this stream before it goes to a POTW. For other facilities, the deadline for compliance with the ELG requirements for FGDS wastewater will be as long as 2023, while CWLP must come into compliance by November 2018. EPA Region V has advised both permitting authorities – our POTW and Illinois EPA -- that this November 1, 2018 deadline must be incorporated into both the Pretreatment and NPDES permits. CWLP's consultants have indicated it will be next to impossible for CWLP to meet the November 2018 PSES deadline due to limited available technologies. Engineering consultants have also found that many of the currently available technologies

can only be installed after initial pilot testing for treatment of our high-chloride scrubber wastewater to confirm that the PSES for selenium will be met, contrary to the conclusions of EPA in the final ELG rule. This need for expensive pilot testing will increase CWLP's costs of compliance beyond those anticipated by the ELG rule justification documents.

We have thus far spent over $450,000 for engineering consultants to study alternatives and costs for compliance with the ELG and CCR rules. Over the next 6 months, that cost will likely rise to over $700,000. Very soon, Springfield will be expected to make binding commits to engage an engineering design consultant at an estimated cost of $3 million. Preliminary engineering work indicates the costs of treatment for CWLP to modify its current facility could be from $41 million to $55 million, on top of what has already been spent for its pretreatment facility in 2009 ($15 million). This does not include an additional $2 million to $3.7 million in estimated annual operating and maintenance costs to meet the stringent new pretreatment standard for selenium.

In addition to the $41 million to $55 million cost of compliance with the PSES portion of the ELG regulations, CWLP is expected to face costs in the range of $45 million to $60 million to achieve compliance with the CCR rule and remaining portions of the ELG rule for dry ash conversion. If all of these costs are required and none of these requirements are alleviated, CWLP would have to consider the viability of continuing to operate the two older of our four coal burning units. Significant rate increases will also be needed to meet the up-front and ongoing costs of implementing these systems. The impact on grid reliability of the premature retirement of base load generating units that burn on-site solid fuel for electric generation must be taken into account in evaluating the costs of the ELG rule.

Beyond a deadline that can't be met and tens of millions in new costs, in CWLP's case, meeting the ELG's pretreatment standard for selenium has zero environmental benefit. The discharge from the local sanitary district already meets all applicable discharge limits and contains a lower influent concentration of selenium than the effluent limit the new rules require. EPA provided a mechanism that its representatives advised would provide CWLP necessary relief from the PSES; however, the removal credit process is not available to a sanitary district that receives so little selenium that it is not detectable in its discharge. When wastewater leaves our facility it contains selenium levels of approximately 0.4 mg/l. On the other hand, the influent levels of selenium at our POTW are extremely low (and often below the detection limit) and the POTW discharges selenium generally at a level below the detection limit and consistently in compliance with their NPDES permit and the state water quality standards at the end of pipe without reliance on a mixing zone. As this wastestream has been sent to our POTW since 2009 and our POTW has maintained compliance with its NPDES limits, there is no reason to conclude that PSES limits were necessary to prevent interference or pass-through of pollutants at the POTW. Never-the-less, EPA has indicated that removal credits are not available to our facility, contrary to the purpose of the pretreatment provisions of the Clean Water Act.

The ELG rule is currently on appeal in *Southwestern Electric Power Company, et al. v. USEPA and Gina McCarthy,* No. 15-60821, US Court of Appeals, 5th Circuit. In the briefs in this case and in the Petition for Reconsideration filed with EPA on March 24, 2017, UWAG has argued that EPA did not properly analyze the costs of the standards set by the ELG rule and has failed to be transparent as to how the figures in the rule were derived. They have identified Executive Order 13777, Enforcing the Regulatory Reform Agenda (Feb. 24, 2017) and violations of the letter and spirit of the Data Quality Act and its implementing regulations as a basis for reconsideration of the ELG rule. Under Executive Order 13777, UWAG has indicated the ELG rule should be revisited based on its 1) effect on jobs, 2) costs that exceed benefits, and 3) lack of transparency of the underlying information.

The Advocacy Office of the SBA has supported the argument of UWAG that Executive Order 13777 requires a reevaluation of the ELG rule. SBA has also based its request to reopen the rulemaking for reconsideration on Executive Order 13771 on "Reducing Regulation and Controlling Regulatory Costs," which requires the revision of costly regulations that are not justified by their benefits. SBA has pointed out that EPA failed to adopt alternatives in the proposed rule, which would have mitigated impacts on small business and refused to convene a Small Business Regulatory Enforcement Fairness Act panel under the Regulatory Flexibility Act.

As explained in SBA's petition, the proposed ELG rule contained an option exempting smaller plants like CWLP's from FGD requirements. The City of Springfield provided comments in 2013 in support of this alternative in the proposal, but instead has been subjected to the same limitations as much larger facilities that directly discharge their FGD wastewater. The City of Springfield also commented to EPA during the public comment period in support of limiting applicability of the ELG to certain wastestreams at facilities over 250MW and to limiting the PSES for FGD wastewater to plants with a total wet-scrubbed capacity of less than 2,000 MW. Confident in the quality of its environmental controls and uniqueness of its site-specific conditions, the City of Springfield provided comments advocating for an alternative under the ELG rule that would have allowed POTWs and State regulators to establish limitations for indirect dischargers using best professional judgment.

Finally, SBA has argued with regard to the pretreatment standards for indirect dischargers that these facilities "face the same stringent standards required for direct dischargers, despite the fact that these discharges go through publicly-owned treatment plants before discharging into the waters of the United States. Given the extremely limited pollutant loadings and relative high costs, according to EPA's own analysis, these requirements appear ripe for substantial reduction or elimination." SBA (4/5/2017) p. 11. SBA has called on EPA to postpone the effective date of these requirements.

Revisiting the ELG rule also appears to be supported and possibly even required under, the "Promoting Energy Independence and Economic Growth" Executive Order issued on March 28, 2017. The Executive Order requires agencies to review all existing regulations that have the potential to burden the development or use of domestic energy, including coal. CWLP is one of the few electric utilities committed to the use of Illinois coal and imposing overly stringent environmental regulations on similar facilities will discourage the use of domestic coal resources and may result in their premature retirement.

The City of Springfield, Illinois supports these efforts of UWAG and SBA to reopen the ELG rule for reconsideration and requests that EPA administration seek a remand of the rule and immediate stay of its deadlines from the Court of Appeals. In any reevaluation of the ELG rule, EPA should consider eliminating the pretreatment standard of the ELG rule and exempting smaller facilities from certain requirements. It is imperative to Springfield that EPA take action to immediately stay or extend the current deadline of November 2018 for indirect dischargers before substantial capital investments ($41 million to $50 million for example in CWLP's case) must be spent to achieve compliance.

From: Warner, Elizabeth [mailto:elizabeth.warner@santeecooper.com]
Sent: Monday, July 24, 2017 2:09 PM
To: Greenwalt, Sarah <greenwalt.sarah@epa.gov>
Cc: Stephen Fotis <scf@vnf.com>
Subject: Call

Sarah,

Very nice to meet you today. Thanks for all the work you have been doing on water issues for EPA. Stephen Fotis and I are available for a call re ELG anytime tomorrow. Stephen is very familiar with the issues we discussed. We look forward to hearing from you.

Thanks,

Babs

Elizabeth Henry Warner

Vice President Legal Services and

Corporate Secretary

Santee Cooper

(843) 761-7044

ehwarner@santeecooper.com

To: Dravis, Samantha[dravis.samantha@epa.gov]; Greenwalt, Sarah[greenwalt.sarah@epa.gov]
Cc: Warner, Elizabeth[elizabeth.warner@santeecooper.com]; Brown, Byron[brown.byron@epa.gov]
From: Stephen Fotis
Sent: Tue 7/25/2017 3:26:24 PM
Subject: RE: [EXTERNAL SENDER] RE: Call

Thanks Sarah. Samantha please let us know when it is convenient to follow up with you and Bryon on the CCR issues.

Best,

Stephen

Stephen Fotis

Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Tuesday, July 25, 2017 11:24 AM
To: Greenwalt, Sarah
Cc: Stephen Fotis; Warner, Elizabeth; Brown, Byron
Subject: Re: [EXTERNAL SENDER] RE: Call

Oh ok! No problem

Sent from my iPhone

On Jul 25, 2017, at 11:23 AM, Greenwalt, Sarah <greenwalt.sarah@epa.gov> wrote:

Sam, sorry for the confusion, but this call at 11 was to discuss something raised at our meeting the other day, not CCR. I think Stephen will be working to set up a separate call on CCR with you and Byron.

Sent from my iPhone

On Jul 25, 2017, at 11:04 AM, Stephen Fotis <scf@vnf.com> wrote:

That is fine. Why don't you call my number – 202 298-1908.

Stephen

Stephen Fotis

Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

From: Greenwalt, Sarah [mailto:greenwalt.sarah@epa.gov]
Sent: Tuesday, July 25, 2017 11:02 AM
To: Warner, Elizabeth
Cc: Stephen Fotis; Brown, Byron; Dravis, Samantha
Subject: Re: [EXTERNAL SENDER] RE: Call

I am running a few minutes behind at another meeting. Sorry, if you'll give me 5 minutes that would be great.

Sent from my iPhone

On Jul 24, 2017, at 6:49 PM, Warner, Elizabeth

<elizabeth.warner@santeecooper.com> wrote:

Sarah,

11 a.m. suits Stephen and me. Should we call your office?

Thanks also for the opportunity to talk with Byron and Samantha. Stephen is coordinating getting in touch with them quickly to share information.

Thanks,

Babs

Elizabeth Henry Warner

Vice President Legal Services and

Corporate Secretary

Santee Cooper

(843) 761-7044

ehwarner@santeecooper.com

From: Greenwalt, Sarah [mailto:greenwalt.sarah@epa.gov]
Sent: Monday, July 24, 2017 6:08 PM
To: Warner, Elizabeth
Cc: Stephen Fotis; Brown, Byron; Dravis, Samantha
Subject: [EXTERNAL SENDER] RE: Call

WARNING: This e-mail is from an external sender. Use caution when opening attachments and clicking links.

Thank you Elizabeth! It was a very productive meeting. I'm cc'ing Byron Brown and Samantha Dravis who are very familiar with CCR. If you would please communicate to them what you were sharing with the Administrator today, that would be very helpful.

As of now, I'm free from 11-11:30 and 3:00-3:45 to discuss the other.

Thanks!

Sarah A. Greenwalt

Senior Advisor to the Administrator

for Water and Cross-Cutting Issues

U.S. Environmental Protection Agency

Work: 202-564-1722|Cell: 202-816-1388

Greenwalt.Sarah@epa.gov

From: Warner, Elizabeth [mailto:elizabeth.warner@santeecooper.com]
Sent: Monday, July 24, 2017 2:09 PM
To: Greenwalt, Sarah <greenwalt.sarah@epa.gov>
Cc: Stephen Fotis <scf@vnf.com>
Subject: Call

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Thanks,

Babs

Elizabeth Henry Warner

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Corporate Secretary

Santee Cooper

(843) 761-7044

ehwarner@santeecooper.com

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EPA Finalizes Rule to Postpone Steam Electric Power Plant Effluent Guidelines Rule

09/13/2017

Contact Information:
(press@epa.gov)

WASHINGTON – The U.S. Environmental Protection Agency (EPA) has finalized a rule postponing certain compliance dates by two years for the effluent limitations guidelines and standards for steam electric power plants (ELG Rule) that were issued in November 2015.

"Today's final rule resets the clock for certain portions of the agency's effluent guidelines for power plants, providing relief from the existing regulatory deadlines while the agency revisits some of the rule's requirements," said **EPA Administrator Scott Pruitt**.
The final rule postpones the compliance dates for the best available technology economically achievable ("BAT") effluent limitations and pretreatment standards ("PSES") for two wastestreams at existing sources, bottom ash transport water and flue gas desulfurization ("FGD") wastewater, for a period of two years.

Last month, the Administrator announced that he would reconsider BAT effluent limitations and PSES in the 2015 rule that apply to bottom ash transport water and FGD wastewater. As part of this upcoming rulemaking, EPA will provide an opportunity for public comment on any proposed revisions to the 2015 final rule.

At this time, EPA does not intend to conduct a rulemaking that would potentially revise BAT effluent limitations and PSES in the 2015 rule for fly ash transport water, flue gas mercury control wastewater, and gasification wastewater, or any of the other requirements in the 2015 rule.

EPA is posting a pre-publication copy of today's final rule at:

https://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule#pending

Rule 28 Revocation of Permits (Revised 07/18/72)
Rule 29 Conditions on Permits (Revised 03/14/06)
Rule 30 Permit Renewal (Revised 04/13/04)
Rule 32 Breakdown Conditions: Emergency Variances, A., B.1., and D. only. (Revised 02/20/79)
Rule 33 Part 70 Permits-General (Revised 04/12/11)
Rule 33.1 Part 70 Permits—Definitions (Revised 04/12/11)
Rule 33.2 Part 70 Permits—Application Contents (Revised 04/10/01)
Rule 33.3 Part 70 Permits—Permit Content (Revised 09/12/06)
Rule 33.4 Part 70 Permits—Operational Flexibility (Revised 04/10/01)
Rule 33.5 Part 70 Permits—Timeframes for Applications, Review and Issuance (Adopted 10/12/93)
Rule 33.6 Part 70 Permits—Permit Term and Permit Reissuance (Adopted 10/12/93)
Rule 33.7 Part 70 Permits—Notification (Revised 04/10/01)
Rule 33.8 Part 70 Permits—Reopening of Permits (Adopted 10/12/93)
Rule 33.9 Part 70 Permits—Compliance Provisions (Revised 04/10/01)
Rule 33.10 Part 70 Permits—General Part 70 Permits (Adopted 10/12/93)
Rule 34 Acid Deposition Control (Adopted 03/14/95)
Rule 35 Elective Emission Limits (Revised 04/12/11)
Rule 36 New Source Review—Hazardous Air Pollutants (Adopted 10/06/98)
Rule 42 Permit Fees (Revised 04/12/16)
Rule 44 Exemption Evaluation Fee (Revised 04/08/08)
Rule 45 Plan Fees (Adopted 06/19/90)
Rule 45.2 Asbestos Removal Fees (Revised 08/04/92)
Rule 47 Source Test, Emission Monitor, and Call-Back Fees (Adopted 06/22/99)
Rule 50 Opacity (Revised 04/13/04)
Rule 52 Particulate Matter—Concentration (Grain Loading)(Revised 04/13/04)
Rule 53 Particulate Matter—Process Weight (Revised 04/13/04)
Rule 54 Sulfur Compounds (Revised 01/14/14)
Rule 56 Open Burning (Revised 11/11/03)
Rule 57 Incinerators (Revised 01/11/05)
Rule 57.1 Particulate Matter Emissions From Fuel Burning Equipment (Adopted 01/11/05)
Rule 62.7 Asbestos-Demolition and Renovation (Adopted 06/16/92, Effective 09/01/92)
Rule 63 Separation and Combination of Emissions (Revised 11/21/78)
Rule 64 Sulfur Content of Fuels (Revised 04/13/99)
Rule 68 Carbon Monoxide (Revised 04/13/04)
Rule 71 Crude Oil and Reactive Organic Compound Liquids (Revised 12/13/94)
Rule 71.1 Crude Oil Production and Separation (Revised 06/16/92)
Rule 71.2 Storage of Reactive Organic Compound Liquids (Revised 09/26/89)
Rule 71.3 Transfer of Reactive Organic Compound Liquids (Revised 06/16/92)
Rule 71.4 Petroleum Sumps, Pits, Ponds, and Well Cellars (Revised 06/08/93)
Rule 71.5 Glycol Dehydrators (Adopted 12/13/94)
Rule 72 New Source Performance Standards (NSPS) (Revised 09/9/08)
Rule 73 National Emission Standards for Hazardous Air Pollutants (NESHAPS) (Revised 09/9/08)
Rule 74 Specific Source Standards (Adopted 07/06/76)
Rule 74.1 Abrasive Blasting (Revised 11/12/91)
Rule 74.2 Architectural Coatings (Revised 01/12/10)
Rule 74.6 Surface Cleaning and Degreasing (Revised 11/11/03—effective 07/01/04)
Rule 74.6.1 Batch Loaded Vapor Degreasers (Adopted 11/11/03—effective 07/01/04)
Rule 74.7 Fugitive Emissions of Reactive Organic Compounds at Petroleum Refineries and Chemical Plants (Revised 10/10/95)
Rule 74.8 Refinery Vacuum Producing Systems, Waste-Water Separators and Process Turnarounds (Revised 07/05/83)
Rule 74.9 Stationary Internal Combustion Engines (Revised 11/08/05)
Rule 74.10 Components at Crude Oil Production Facilities and Natural Gas Production and Processing Facilities (Revised 03/10/98)
Rule 74.11 Natural Gas-Fired Residential Water Heaters—Control of NO_X (Revised 05/11/10)
Rule 74.11.1 Large Water Heaters and Small Boilers (Revised 09/11/12)
Rule 74.12 Surface Coating of Metal Parts and Products (Revised 04/08/08)
Rule 74.15 Boilers, Steam Generators and Process Heaters (5 MMBTUs and greater) (Revised 11/08/94)
Rule 74.15.1 Boilers, Steam Generators and Process Heaters (1 to 5 MMBTUs) (Revised 06/23/15)
Rule 74.16 Oil Field Drilling Operations (Adopted 01/08/91)
Rule 74.20 Adhesives and Sealants (Revised 09/11/12)
Rule 74.23 Stationary Gas Turbines (Revised 1/08/02)
Rule 74.24 Marine Coating Operations (Revised 09/11/12)
Rule 74.24.1 Pleasure Craft Coating and Commercial Boatyard Operations (Revised 01/08/02)
Rule 74.26 Crude Oil Storage Tank Degassing Operations (Adopted 11/08/94)
Rule 74.27 Gasoline and ROC Liquid Storage Tank Degassing Operations (Adopted 11/08/94)
Rule 74.28 Asphalt Roofing Operations (Adopted 05/10/94)
Rule 74.30 Wood Products Coatings (Revised 06/27/06)
Rule 74.31 Metal Working Fluids and Direct-Contact Lubricants (Adopted 11/12/13)
Rule 75 Circumvention (Revised 11/27/78)
Rule 101 Sampling and Testing Facilities (Revised 05/23/72)
Rule 102 Source Tests (Revised 04/13/04)
Rule 103 Continuous Monitoring Systems (Revised 02/09/99)
Rule 154 Stage 1 Episode Actions (Adopted 09/17/91)
Rule 155 Stage 2 Episode Actions (Adopted 09/17/91)
Rule 156 Stage 3 Episode Actions (Adopted 09/17/91)
Rule 158 Source Abatement Plans (Adopted 09/17/91)
Rule 159 Traffic Abatement Procedures (Adopted 09/17/91)
Rule 220 General Conformity (Adopted 05/09/95)
Rule 230 Notice to Comply (Revised 9/9/08)

* * * * *

[FR Doc. 2017–19704 Filed 9–15–17; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 423

[EPA–HQ–OW–2009–0819; FRL–9967–90–OW]

RIN 2040–AF76

Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Under the Clean Water Act (''CWA''), The Environmental Protection Agency (EPA) intends to conduct a rulemaking to potentially revise certain best available technology economically achievable (''BAT'') effluent limitations and pretreatment standards for existing sources (''PSES'') for the steam electric power generating point source category, which were published in the **Federal Register** on November 3, 2015. EPA is, accordingly, postponing the associated compliance dates in the 2015 Rule. In particular, EPA is postponing the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES for flue gas desulfurization (''FGD'') wastewater and bottom ash transport water in the 2015 Rule for a period of two years. At this time, EPA does not intend to conduct a rulemaking that would potentially revise the new, more stringent BAT effluent limitations and pretreatment standards in the 2015 Rule for fly ash transport water, flue gas mercury control wastewater, and gasification wastewater, or any of the other requirements in the 2015 Rule. As such, EPA is not changing the compliance dates for the BAT limitations and PSES established by the 2015 Rule for these wastestreams. EPA's action to postpone certain compliance dates in the 2015 Rule is intended to preserve the status quo for FGD wastewater and bottom ash transport

water until EPA completes its next rulemaking concerning those wastestreams, and it thus does not otherwise amend the effluent limitations guidelines and standards for the steam electric power generating point source category.

DATES: The final rule is effective September 18, 2017. In accordance with 40 CFR part 23, this regulation shall be considered issued for purposes of judicial review at 1 p.m. Eastern Standard Time on October 2, 2017. Under section 509(b)(1) of the CWA, judicial review of this regulation can be had only by filing a petition for review in the U.S. Court of Appeals within 120 days after the regulation is considered issued for purposes of judicial review. Under section 509(b)(2), the requirements in this regulation may not be challenged later in civil or criminal proceedings brought by EPA to enforce these requirements.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA–OW–2009–0819. All documents in the docket are listed on the *https://www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through *https://www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: Ronald Jordan, United States Environmental Protection Agency, Engineering and Analysis Division; telephone number: (202) 566–1003; email address: *jordan.ronald@epa.gov.* Electronic copies of this document and related materials are available on EPA's Web site at *https://www.epa.gov/eg/steam-electric-power-generatingeffluent-guidelines-2015-final-rule.* Copies of this final rule are also available at *http://www.regulations.gov.*

SUPPLEMENTARY INFORMATION:

I. Background

On November 3, 2015, the EPA published a final rule amending 40 CFR part 423, the effluent limitations guidelines and standards for the steam electric power generating point source category, under Sections 301, 304, 306, 307, 308, 402, and 501 of the CWA (33 U.S.C. 1311, 1314, 1316, 1317, 1318, 1342, and 1361). The amendments addressed limitations and standards on various wastestreams at steam electric power plants: FGD wastewater, bottom ash transport water, fly ash transport water, flue gas mercury control wastewater, gasification wastewater, and combustion residual leachate. Collectively, this rulemaking is known as the ''Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category,'' or ''2015 Rule.'' For further information on the 2015 Rule, see 80 FR 67838 (November 3, 2015).

EPA received seven petitions for review of the 2015 Rule. The U.S. Judicial Panel on Multi-District Litigation issued an order on December 8, 2015, consolidating all of the petitions in the U.S. Court of Appeals for the Fifth Circuit, *Southwestern Electric Power Co., et al.* v. *EPA,* No. 15–60821.

In a letter dated March 24, 2017, the Utility Water Act Group (''UWAG'') [1] submitted a petition for reconsideration of the 2015 Rule which requested that EPA suspend the Rule's approaching deadlines. UWAG supplemented its petition with additional information in a letter dated April 13, 2017. In a letter dated April 5, 2017, the Small Business Administration (''SBA'') Office of Advocacy sent EPA a second petition for reconsideration of the 2015 Rule, which expressly supports UWAG's petition and raises issues that SBA considers to be pertinent to small businesses. The petitions raise wide-ranging objections to the Rule.[2] Among other things, the UWAG petition points to new data which they believe show that plants burning subbituminous and bituminous coal cannot comply with the 2015 Rule's limitations and standards for FGD wastewater and questions EPA's characterization of bottom ash transport water. UWAG also requested that EPA suspend or delay the ''rule's fast-approaching compliance deadlines while EPA works to reconsider and revise, as appropriate, the substantive requirements of the current rule.''

In an April 12, 2017 letter to those who submitted the reconsideration petitions, the Administrator announced his decision to reconsider the 2015 Rule. See DCN SE06612. As explained in that letter, after considering the objections raised in the reconsideration petitions, the Administrator determined that it is appropriate and in the public interest to reconsider the Rule. On April 14, 2017, EPA requested that the Fifth Circuit hold the case in abeyance while the Agency undertook reconsideration. On April 24, 2017, the Fifth Circuit granted the motion and placed the case in abeyance.

On June 6, 2017 (82 FR 26017), EPA proposed to postpone the compliance dates for the new, more stringent, BAT effluent limitations and PSES in the 2015 Rule for each of the following wastestreams: FGD wastewater, bottom ash transport water, fly ash transport water, flue gas mercury control wastewater, and gasification wastewater, while reconsideration of the 2015 Rule was underway. EPA explained that this postponement would preserve the regulatory status quo with respect to wastestreams subject to the 2015 Rule's new, and more stringent, limitations and standards during reconsideration and that postponement of compliance dates is intended to prevent the unnecessary expenditure of resources until EPA finalizes any rulemaking as a result of its reconsideration of the 2015 Rule. EPA also solicited comments on whether this postponement should be for a specified period of time, for example, two years.

On August 11, 2017, EPA sent a second letter to those who had requested reconsideration of the 2015 Rule, announcing the Administrator's decision to conduct a new rulemaking to potentially revise the new, more stringent BAT limitations and PSES in the 2015 Rule that apply to two wastestreams: FGD wastewater and bottom ash transport water. See DCN SE06670. On August 14, 2017, EPA filed a motion to govern further proceedings in the U.S. Court of Appeals for the Fifth Circuit, which explained that EPA intends to conduct further rulemaking to potentially revise the new, more stringent BAT/PSES requirements in the 2015 Rule applicable to FGD wastewater and bottom ash transport water, and requested, in part, that the Court sever and hold in abeyance all judicial proceedings concerning portions of the 2015 Rule related to those particular requirements. On August 22, 2017, the Court granted EPA's motion.

In an earlier action, EPA administratively postponed certain compliance dates that had not yet passed in part of the 2015 Rule pursuant to Section 705 of the Administrative Procedure Act (''APA''), 5 U.S.C. 705, which states that ''[w]hen an agency finds that justice so requires, it may postpone the effective date of action taken by it pending judicial review.'' 82 FR 19005 (April 25, 2017). EPA had postponed the compliance dates as a

[1] According to the petition, UWAG is a voluntary, ad hoc, unincorporated group of 163 individual energy companies and three national trade associations of energy companies: Edison Electric Institute, the National Rural Electric Cooperative Association, and the American Public Power Association.

[2] A copy of each petition and the supplemental information is included in the docket for this rule, Docket ID No. EPA–HQ–OW–2009–0819.

temporary measure pursuant to Section 705 to preserve the status quo while the litigation in the Fifth Circuit was pending and EPA's reconsideration was underway. Because EPA has decided to conduct further rulemaking to potentially revise the new, more stringent BAT limitations and PSES in the 2015 Rule applicable to two specific wastestreams (FGD wastewater and bottom ash transport water), and it is today finalizing a rule which postpones the associated compliance dates in the 2015 Rule pending its next rulemaking, there is no longer any need for the Agency to maintain its prior action pursuant to Section 705 of the APA. EPA, hereby, withdraws that action.

II. Summary of Comments Received

EPA received thousands of written comments on the proposed rule to postpone certain compliance dates in the 2015 Rule. EPA also held a public hearing on July 31, 2017. The comments on the proposed rule generally fall into one of four categories: (1) Support for postponement of compliance dates; (2) opposition to the postponement of compliance dates; (3) comments on the substantive requirements of the 2015 Rule (which are outside the scope of this action, which concerns postponing certain compliance dates only); and (4) comments on the length of time that EPA should postpone the compliance dates.

Commenters that support the postponement rule generally assert that the postponement is appropriate to prevent industry from spending ''unnecessary resources'' until EPA completes its reconsideration of the 2015 Rule. Many commenters who support a postponement in compliance dates state that, given the substantial costs required to implement technology required to comply with the 2015 Rule, as well as the time needed for designing and optimizing treatment systems, certainty in the discharge requirements is needed and postponement of compliance dates allows for that. In addition, commenters argue that the Agency has both the authority and the responsibility to postpone the 2015 Rule until it completes any rulemaking following its reconsideration process.

Comments on the length of the postponement generally assert that EPA should postpone the compliance dates for a minimum of two years, until EPA has taken final action on any rule revisions, or some time period beyond when EPA has taken final action on any rule revisions.

Commenters that oppose the postponement rule generally assert that (1) the technology bases underlying the 2015 Rule are widely available and affordable now, many steam electric plants have already installed or are in the process of implementing these technologies, and postponing the compliance dates would hinder technology development; (2) any postponement allows power plants to continue to discharge pollutants that are harmful to public health and the environment, and the forgone public health and environmental benefits during any postponement outweigh the costs to industry; and (3) EPA lacks authority to postpone the compliance dates.

III. Rationale for Finalizing a Postponement of Compliance Dates

In light of new information not contained in the record for the 2015 Rule and the inherent discretion the Agency has to reconsider past policy decisions consistent with the CWA and other applicable law, EPA intends to conduct a new rulemaking regarding the appropriate technology bases and associated limits for the BAT/PSES requirements applicable to FGD wastewater and bottom ash transport water discharged from steam electric power plants. Given this, and after carefully considering comments received on the proposed rule, EPA finds it appropriate to postpone the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES applicable to FGD wastewater and bottom ash transport water in the 2015 Rule until it completes the new rulemaking. This maintains the 2015 Rule as a whole at this time, with the only change being to postpone specific compliance deadlines for two wastestreams. Thus, the earliest compliance dates for plants to meet the new, more stringent FGD wastewater and bottom ash wastewater limitations and standards in the 2015 Rule, which were to be determined by the permitting authority as a date ''as soon as possible beginning November 1, 2018 . . .'', are now to be determined by the permitting authority as a date ''as soon as possible beginning November 1, 2020 . . . .'' EPA is not changing the ''no later than'' date of December 31, 2023, because EPA is not aware that the 2023 date is an immediate driver for expenditures by plants (petitioners had requested relief from the ''fast-approaching compliance deadlines'' in the 2015 Rule), and EPA plans to take up the appropriate compliance period in its next rulemaking. In order to be absolutely clear about what is being postponed, the final rule includes more precise regulatory text to implement the rule than was included in the proposed rule.

Agencies have inherent authority to reconsider past decisions and to revise, replace or repeal a decision to the extent permitted by law and supported by a reasoned explanation. *FCC* v. *Fox Television Stations, Inc.,* 556 U.S. 502, 515 (2009); *Motor Vehicle Mfrs. Ass'n* v. *State Farm Mutual Auto. Ins. Co.,* 463 U.S. 29, 42 (1983). *See also Nat'l Ass'n of Home Builders* v. *EPA,* 682 F.3d 1032, 1038 & 1043 (D.C. Cir. 2012). Particularly relevant here, the CWA expressly authorizes EPA to revise effluent limitations and standards. 33 U.S.C. 1311(d), 1314(b), (g)(1), (m)(1)(A), 1317(b)(2). Moreover, in doing so, Section 304(b)(2)(B) of the CWA directs EPA to consider several factors, including ''other factors as the Administrator deems appropriate,'' and the Agency is afforded considerable discretion in deciding how much weight to give each factor. *See, e.g., Weyerhaeuser Co.* v. *Costle,* 590 F.2d 1011, 1045 (D.C. Cir. 1978). In this case, where EPA has decided to undertake a new rulemaking, which may result in substantive changes to the 2015 Rule, that is an appropriate factor to consider and one that warrants the postponement of compliance dates for the new, more stringent BAT and PSES requirements for two wastestreams in the 2015 Rule, until such a rulemaking is complete (*i.e.,* EPA issues any final rule that substantively revises the 2015 Rule or EPA decides not to issue such a final rule). This will prevent the potentially needless expenditure of resources during a rulemaking that may ultimately change the 2015 Rule in these respects.

As mentioned, some commenters stated that the record for the 2015 Rule demonstrates that the technologies underlying the new, more stringent requirements for FGD wastewater and bottom ash transport water are widely available and affordable. Notwithstanding statements in the 2015 Rule record, certain parties have raised serious concerns about the availability and affordability of the technology basis for the FGD wastewater and bottom ash transport water requirements in the 2015 Rule, and the Administrator wishes to take some time to carefully review these requirements in light of those concerns and ensure any such requirements are technologically available and economically achievable within the meaning of the statute. EPA has discretion in determining technological availability and economic achievability and is not constrained by the CWA to make the same policy decision as the former Administration, so long as its decision is reasonable. As explained above, the Agency may

reconsider past policy decisions consistent with the Clean Water Act and other applicable law. The Agency may also reconsider technical determinations in light of new information submitted to the Agency that was not in the record for the 2015 Rule. EPA intends to fully evaluate all of the issues raised in the petitions, including concerns about: Cost and impacts to steam electric facilities, public availability of information on which the rule is based, lack of data for plants that burn certain types of coal, and validity of certain pollutant data used in EPA's 2015 Rule analysis. For example, petitioners raised concerns about the numerical BAT limitations and PSES applicable to FGD wastewater in the 2015 Rule. They assert that there are differences among coal types that affect the performance and costs of biological treatment and that EPA did not have data to demonstrate the performance of biological treatment on all coal types. To resolve this concern, following the rulemaking, industry collected (and continues to collect) additional data on the performance of biological treatment for different coal types. As another example, petitioners raised questions about the inclusion and validity of certain data due, in part, to what they assert are flaws in data acceptance criteria, obsolete analytical methods, and the treatment of non-detect analytical results, which petitioners believed resulted in an overestimation of pollutant loadings for bottom ash transport water. EPA agrees that these are important issues that warrant further consideration in conjunction with the statutory factors for determining BAT for these wastestreams. EPA thus intends to re-evaluate these and other concerns raised in the petitions in the next rulemaking. EPA acknowledges that postponement of certain of the 2015 Rule's compliance dates may be disruptive to vendors and treatment technology suppliers. EPA, however, must also consider the substantial investments required by the steam electric power industry to comply with the BAT limitations and PSES,[3] and that certainty regarding the limitations and standards deserves prominent consideration by the Agency when these limitations and standards may change. As UWAG pointed out in its April 13, 2017 letter, ''a rule of this magnitude and complexity requires substantial time to come into compliance for multiple wastestreams. Detailed studies and planning, followed by large capital expenditures and subsequent installation and testing, are time-consuming.'' Companies have been evaluating their compliance options and are reaching the point at which they will be committing funds, incurring costs, or commencing construction to install technologies.

As part of the 2015 Rule, EPA estimated the costs associated with compliance with the 2015 Rule's new requirements. For all applicable wastestreams, EPA assessed the operations and treatment system components, identified equipment and process changes that the plant would likely make to meet the 2015 Rule, and estimated the cost to implement those changes. This includes, among other things, the capital costs of installing the technology (based on estimates of the technology selected as representing the level of control) and the operation and maintenance costs of operating the technology. See Technical Development Document (''TDD''), pp. 9–1 through 9–52. EPA estimated that the total post-tax annualized compliance costs would be $339.6 million/year. See Regulatory Impact Analysis (''RIA''), Table 3–2 (Option D).[4]

The 2015 rulemaking record also describes evaluation of the initial capital costs that regulated parties would incur in the near term (if a stay were not in place) to meet the 2015 Rule's effluent limitations and standards. For the purpose of analysis, in the RIA, EPA assumed that all capital costs are incurred concurrently with technology installation according to discharge permit renewal schedules, but EPA realizes that feasibility studies and planning may need to be completed in advance of that date. Specifically, plants would incur engineering design costs, costs to acquire equipment, freight shipping costs to transport equipment from manufacturers to the installation site, costs for actions to prepare the site (such as installing concrete foundations and buildings for the new equipment), and construction expenses associated with connecting electrical and piping systems to new equipment. See TDD, p. 9–3. EPA estimated post-tax annualized capital costs of $204.4 million/year. See RIA, Table 3–2 (Option D). Although there is a wide degree of variability among the costs particular plants would expend, EPA estimates that the average post-tax annualized capital compliance costs for a plant would be approximately $1.5 million/year. See TDD, Table 9–19 (plants with compliance costs); RIA, Table 3–2 (Option D). To the extent that these costs are associated with the 2015 Rule requirements for FGD wastewater and bottom ash transport water, and in the event that EPA revises these requirements in a future rulemaking, these are costs that would be incurred for activities that ultimately might not be necessary. In that case, this would reflect costs incurred by facilities and potentially passed on to utility rate payers that ultimately did not need to be spent.

In light of these imminent planning and capital expenditures that facilities incurring costs under the 2015 Rule would need to undertake in order to meet the earliest compliance deadlines for the new, more stringent limitations and standards in the 2015 Rule, and the fact that the Agency is conducting a new rulemaking regarding the appropriate technology bases and associated limits for BAT limitations and PSES applicable to FGD wastewater and bottom ash transport water, the Agency views it as appropriate to postpone the earliest compliance dates that have not yet passed for these wastestreams in 2015 Rule. This will preserve the regulatory status quo with respect to requirements for FGD wastewater and bottom ash transport water until the new rulemaking is complete.

Some commenters also express concerns that postponement of compliance dates would hinder technology advancements. EPA's experience does not support this concern. The record for the 2015 Rule demonstrates that technology advancements were not hindered during that rulemaking. Rather, as explained in the preamble to the final 2015 Rule, vendors continued to improve existing technologies and to develop new technologies during the rulemaking leading up to the 2015 Rule.

EPA acknowledges that postponement of the compliance dates could lead to a delay in the accrual of some of the benefits attributable to the 2015 Rule. The 2015 Rule required that steam electric power plants would comply with the new, more stringent requirements no later than 2023, with plants expected to implement new control technologies over a five-year compliance period of 2019–2023 according to their permit renewal schedule. In the record for the 2015 Rule, EPA estimated the value of certain benefits linked to reduced pollutant

[3] In the 2015 Rule, EPA estimated the total annualized pre-tax compliance costs for the FGD and bottom ash requirements to be $486.8 million. See DCN SE05978.

[4] EPA analyzed both pre-tax and post-tax costs. Pre-tax costs provide insight on the total expenditures as initially incurred by the plants. Post-tax costs are a more meaningful measure of compliance impact on privately owned for-profit plants, and incorporate approximate capital depreciation and other relevant tax treatments in the analysis. RIA, p. 3–6.

discharges that could be monetized for the period 2019 through 2042. Based on the 2015 Rule data and methodology, and depending on the inclusion of the Clean Power Plan, EPA estimates that foregone annualized benefits for a two-year delay would be between $26.6 million and $33.6 million.[5] EPA similarly estimates that plants would experience annualized cost savings of between $27.5 million and $36.8 million as a result of a two-year delay. See DCN SE06668 for additional details, including calculations of the foregone benefits and cost savings. EPA understands that these estimates have uncertainty due to, for example, the possibility of unexpected implementation approaches, and thus that the actual cost savings could have been somewhat higher or lower than estimated. Similarly, due to data and analysis limitations, the forgone monetized benefits are likely underestimated. These estimates, however, are consistent with and reflect the best data and analysis available at the time of the 2015 Rule.

EPA notes that, as explained earlier, there is uncertainty as to the FGD wastewater and bottom ash transport water BAT/PSES requirements while EPA conducts a new rulemaking. If EPA did not postpone the compliance dates, industry would likely incur costs as it prepares to comply with the 2015 Rule, irrespective of what EPA ultimately determines to be BAT/PSES for FGD wastewater and bottom ash transport water. By contrast, under the 2015 Rule, even if permits were written today, the earliest those permits would have required compliance with the limitations and standards at issue are ''as soon as possible beginning November 1, 2018.'' So, while some companies would have to plan to comply and spend money right away, the benefits would not begin to accrue until 2018, at the earliest. Also, these benefits may not be lost if a permitting authority requires similar effluent limitations where necessary to meet applicable water quality standards, under CWA section 301(b)(1)(C). EPA has carefully weighed the concerns about potentially foregone benefits with the consideration of the costs that could needlessly be incurred should the requirements be changed, as well as the overall uncertainty and potential confusion that would be caused by imposing the 2015 Rule requirements while simultaneously undertaking rulemaking that may change those requirements. On balance, EPA has concluded the more reasonable approach is to postpone the compliance dates in the 2015 Rule.

Thus, EPA agrees with commenters who argue that it should postpone the new, more stringent BAT/PSES requirements for FGD wastewater and bottom ash transport water in the 2015 Rule until it completes a new rulemaking on these wastestreams. After reflecting on the time it typically takes the Agency to propose and finalize revised effluent limitations guidelines and standards, and in light the characteristics of this industry and the anticipated scope of the next rulemaking, EPA projects it will take approximately three years to propose and finalize a new rule (Fall 2020). See DCN SE06667. Consequently, EPA is postponing the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES for FGD wastewater and bottom ash transport water for a period of two years (November 1, 2020).[6] To the extent that commenters believe a postponement under this rule should last beyond the time it takes EPA to complete its new rulemaking, such comments are appropriately considered as part of, and in light of, that new rulemaking and not this action. As explained, this rule is intended only as a relatively short-term measure until EPA completes the next rulemaking, and EPA anticipates that the next rulemaking will necessarily address compliance dates in some fashion. Although EPA proposed to postpone the compliance dates for the new, more stringent requirements applicable to fly ash transport water, gasification wastewater, and flue gas mercury control (FGMC) wastewater, in addition to the requirements for FGD wastewater and bottom ash transport water, this final rule does not postpone those former compliance dates. Commenters stated that EPA has no basis to postpone compliance dates for requirements that parties have not expressly argued should be reconsidered, such as those for fly ash transport water and FGMC wastewater. EPA agrees that the final rule should postpone only those requirements that the Agency plans to potentially revise in the next rulemaking. Because EPA is not conducting a new rulemaking concerning any of the other issues addressed by the 2015 Rule, including requirements for fly ash transport water, gasification wastewater, and FGMC wastewater, EPA is not changing the compliance dates for these wastestreams or any of the other compliance dates for the requirements in that Rule. The record for the 2015 Rule demonstrates that changes associated with converting a fly ash system are unrelated from an engineering perspective to conversions/upgrades for bottom ash transport water and FGD treatment systems. Converting a fly ash system requires installing a silo to capture the dry fly ash, which is subsequently transported offsite to beneficial reuse markets (*e.g.,* cement plants) or landfilled. Bottom ash is handled separately, regardless of whether it is wet or dry. The same is true for FGD wastes. EPA recognizes however, that from a financing and long-term planning perspective, there are advantages to a facility in knowing the full suite of requirements it will need to comply with over a longer term planning horizon.

Some facilities commented that they may need to know what the ultimate requirements will be for bottom ash transport water and FGD wastewater to assist them in considering alternatives for meeting the requirements for the other waste streams (fly ash transport water and FGMC wastewater) for which EPA is not postponing the earliest compliance dates. EPA notes that there continues to be discretion under the 2015 Rule for permitting authorities to consider: Time needed to ''expeditiously plan (including time to raise capital), design, procure, and install equipment'' to comply with the rule; changes being made at the plant to comply with several other rules; and ''other factors as appropriate'' in determining exactly when, within a specified compliance period, the 2015 Rule's new, more stringent limitations apply to any given plant. See 40 CFR 423.11(t).

In light of the compliance date postponements being finalized today, in determining the ''as soon as possible date,'' EPA believes it would be reasonable for permitting authorities to consider the need for a facility to make integrated planning decisions regarding compliance with the requirements for all of the wastestreams currently subject to new, more stringent requirements in the 2015 Rule, as well as the other rules identified in § 423.11(t) to the extent that a facility demonstrates such a need. This could include harmonizing schedules to the extent provided for

[5] The calculations are based on the benefits and costs estimated for the 2015 Rule, which were detailed in the ''Benefit and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category'' (BCA) and ''Regulatory Impact Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category'' (RIA) reports.

[6] If EPA does not complete a new rulemaking by November, 2020, it plans to further postpone the compliance dates such that the earliest compliance date is not prior to completion of a new rulemaking.

under the 2015 Rule[7] for meeting the 2015 Rule requirements for fly ash transport water and FGMC wastewater to allow time for a facility to have certainty regarding what their ultimate requirements will be under the steam electric ELGs, as well as the requirements under the other rules listed in § 423.11(t).

This rule is effective immediately upon publication. Section 553(d) of the Administrative Procedure Act, 5 U.S.C. 553(d), provides that publication of a substantive rule must be made no less than 30 days before its effective date, subject to several exceptions. Section 553(d)(1) establishes an exception for ''a substantive rule which grants or recognizes an exemption or relieves a restriction.'' The exception in Section 553(d)(1) reflects the purpose of the 30-day notice requirement, which is to give affected entities time to prepare for the effective date of a rule or to take any other action which the issuance of a rule may prompt. This rule fits within Section 553(d)(1) because it postpones certain requirements on steam electric power plants to control their pollutant discharges by two years, and as a result, it relieves a restriction on regulated entities for that period.

IV. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review; and, Executive Order 13563: Improving Regulation and Regulatory Review

This action is a significant regulatory action that was submitted to the Office of Management and Budget (OMB) for review. Any changes made in response to OMB recommendations have been documented in the docket.

B. Executive Order 13771: Reducing Regulations and Controlling Regulatory Costs

This action is considered an Executive Order 13771 deregulatory action. Details on the estimated cost savings of this final rule can be found in EPA's analysis of the potential costs and benefits associated with this action.

C. Paperwork Reduction Act

This final rule does not involve any information collection activities subject to the PRA, 44 U.S.C. 3501 *et seq.*

D. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. In making this determination, the impact of concern is any significant adverse economic impact on small entities. An agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, has no net burden or otherwise has a positive economic effect on the small entities subject to the rule. This action maintains the 2015 Rule as a whole at this time, with the only change being to postpone specific compliance deadlines for two wastestreams. As described above, EPA estimates that steam electric plants, including some small entities, would experience annualized cost savings of $27.5 million as a result of this two-year delay. We have therefore concluded that this action will relieve regulatory burden for some directly regulated small entities.

E. Unfunded Mandates Reform Act (UMRA)

This action does not contain an unfunded mandate of $100 million or more as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments.

F. Executive Order 13132: Federalism

This action does not have federalism implications, as specified in Executive Order 13132 (64 FR 43255, August 10, 1999). It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have Tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000).

H. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

This final rule is not subject to Executive Order 13045 (62 FR 19885, April 23, 1997) because EPA previously determined that the environmental health risks or safety risks addressed by the requirements EPA is finalizing do not present a disproportionate risk to children.

I. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' because it is not likely to have a significant adverse effect on the supply, distribution or use of energy.

J. National Technology Transfer and Advancement Act (NTTAA)

This rulemaking does not involve technical standards that would require Agency consideration under NTTAA section 12(d), 15 U.S.C. 272 note.

K. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

This is a final rule to delay action, and it does not change the requirements of the effluent limitations guidelines and standards published in 2015. While the postponement in compliance dates could delay the protection the 2015 Rule would afford to all communities, including those impacted disproportionately by the pollutants in certain wastewater discharges, this action would not change any impacts of the 2015 Rule upon implementation. The EPA therefore believes it is more appropriate to consider the impact on minority and low-income populations in the context of possible substantive changes as part of any future rulemaking.

L. Congressional Review Act

This action is subject to the CRA, and the EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is a not a ''major rule'' as defined by 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 423

Environmental protection, Electric power generation, Power plants, Waste treatment and disposal, Water pollution control.

Dated: September 12, 2017.

E. Scott Pruitt,

Administrator.

For reasons stated in the preamble, EPA amends 40 CFR part 423 as set forth below:

PART 423—STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY

■ 1. The authority citation for part 423 continues to read as follows:

Authority: Secs. 101; 301; 304(b), (c), (e), and (g); 306; 307; 308 and 501, Clean Water Act (Federal Water Pollution Control Act

[7] For any final effluent limitation that is specified to become applicable after November 1, 2018, the specified date must be as soon as possible, but in no case later than December 31, 2023.

Amendments of 1972, as amended; 33 U.S.C. 1251; 1311; 1314(b), (c), (e), and (g); 1316; 1317; 1318 and 1361).

■ 2. Amend § 423.11 by revising paragraph (t) introductory text to read as follows:

§ 423.11 Specialized definitions.

* * * * *

(t) The phrase ''as soon as possible'' means November 1, 2018 (except for purposes of § 423.13(g)(1)(i) and (k)(1)(i), and § 423.16(e) and (g), in which case it means November 1, 2020), unless the permitting authority establishes a later date, after receiving information from the discharger, which reflects a consideration of the following factors:

* * * * *

§ 423.13 [Amended]

■ 3. Amend § 423.13 paragraphs (g)(1)(i) and (k)(1)(i) by removing the text ''November 1, 2018'' and adding the text ''November 1, 2020'' in its place.

§ 423.16 [Amended]

■ 4. Amend § 423.16 paragraphs (e) two times, and (g) by removing the text ''November 1, 2018'' and adding the text ''November 1, 2020'' in its place.

[FR Doc. 2017–19821 Filed 9–15–17; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 635

[Docket No. 170602535–7835–01]

RIN 0648–XF480

Atlantic Highly Migratory Species; Adjustments to 2017 Northern Albacore Tuna Quota, 2017 North and South Atlantic Swordfish Quotas, and 2017 Atlantic Bluefin Tuna Reserve Category Quota

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Temporary final rule.

SUMMARY: NMFS adjusts the northern albacore tuna annual baseline quota for 2017 with available underharvest of the 2016 adjusted U.S. northern albacore quota. NMFS also adjusts the North and South Atlantic swordfish baseline quotas for 2017 based on available underharvest from the 2016 adjusted U.S. quotas and international quota transfers. NMFS also augments the 2017 Atlantic bluefin tuna Reserve category quota with available underharvest of the 2016 adjusted U.S. bluefin tuna quota. This action is necessary to implement binding recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT), as required by the Atlantic Tunas Convention Act (ATCA), and to achieve domestic management objectives under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

DATES: Effective September 18, 2017, through December 31, 2017.

ADDRESSES: Supporting documents such as Environmental Assessments and Fishery Management Plans and their Amendments described below may be downloaded from the HMS Web site at *www.nmfs.noaa.gov/sfa/hms/.* These documents also are available upon request from Sarah McLaughlin, Steve Durkee, or Gray Redding at the telephone numbers below.

FOR FURTHER INFORMATION CONTACT: Sarah McLaughlin, 978–281–9260, Steve Durkee, 202–670–6637, or Gray Redding, 301–427–8503.

SUPPLEMENTARY INFORMATION: Regulations implemented under the authority of the Atlantic Tunas Convention Act (ATCA; 16 U.S.C. 971 *et seq.*) and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; 16 U.S.C. 1801 *et seq.*) governing the harvest of northern albacore, swordfish, and bluefin tuna by persons and vessels subject to U.S. jurisdiction are found at 50 CFR part 635. Section 635.27(e) describes the northern albacore annual quota recommended by ICCAT and the annual northern albacore quota adjustment process. Section 635.27(c) describes the quota adjustment process for both North and South Atlantic swordfish. Section 635.27(a) subdivides the ICCAT-recommended U.S. bluefin tuna quota among the various domestic fishing categories, per the allocations established in the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan (2006 Consolidated HMS FMP) (71 FR 58058, October 2, 2006), as amended by Amendment 7 to the 2006 Consolidated HMS FMP (Amendment 7) (79 FR 71510, December 2, 2014), and describes the annual bluefin tuna quota adjustment process. NMFS is required under ATCA and the Magnuson-Stevens Act to provide U.S. fishing vessels with a reasonable opportunity to harvest the ICCAT-recommended quotas.

The northern albacore quota implementation and quota adjustment processes, along with the bluefin tuna quota adjustment process, were previously analyzed in Amendment 7, which published in August 2014 and included a Final Environmental Impact Statement, Final Regulatory Impact Review (RIR), Final Regulatory Flexibility Analysis (FRFA), and Final Social Impact Statement. ICCAT conducted another bluefin tuna stock assessment update in 2014, and, after considering the scientific advice in the stock assessment, adopted a recommendation regarding western Atlantic bluefin tuna management that increases the U.S. bluefin tuna quota for 2015 and 2016 (ICCAT Recommendation 14–05). NMFS published a final rule to implement that baseline annual U.S. bluefin tuna quota on August 28, 2015 (80 FR 52198), and prepared an Environmental Assessment (EA), RIR, and FRFA for that action. ICCAT Recommendation 16–08 extended the U.S. bluefin tuna allocation established in Recommendation 14–05 through 2017.

The North Atlantic swordfish quota adjustment process was previously analyzed in the EA, RIR, and FRFA that were prepared for the 2012 Swordfish Quota Adjustment Rule (July 31, 2012; 77 FR 45273). The South Atlantic swordfish quota adjustment process was previously analyzed in the EA, RIR, and FRFA that were prepared for the 2007 Swordfish Quota Specification Final Rule (October 5, 2007; 72 FR 56929). In the 2016 North and South Atlantic Swordfish Quotas Adjustment Final Rule (July 26, 2016, 81 FR 48719), after taking public comment on the issue, NMFS announced its intent to no longer issue proposed and final specifications/rules for North and South Atlantic swordfish quotas adjustments in cases where the quota adjustment follows previously codified and analyzed formulas. Therefore, beginning this year, NMFS is instead issuing a temporary final rule to adjust the quota, in a similar process to northern albacore and bluefin tuna quota adjustments. NMFS will continue to undertake notice and comment rulemaking when adopting new quotas, quota formulas, or otherwise altering conservation and management measures.

Note that weight information for northern albacore and bluefin tuna below is shown in metric tons (mt) whole weight (ww), and both dressed weight (dw) and ww is shown for swordfish.

Northern Albacore Annual Quota and Adjustment Process

Since 1998, ICCAT has adopted recommendations regarding the northern albacore fishery. The current

No. 18-60079

IN THE UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

CLEAN WATER ACTION; ENVIRONMENTAL INTEGRITY PROJECT; SIERRA CLUB; WATERKEEPER ALLIANCE, INC.; PENNENVIRONMENT, INC.; CHESAPEAKE CLIMATE ACTION NETWORK; PHYSICIANS FOR SOCIAL RESPONSIBILITY, CHESAPEAKE, INC.; PRAIRIE RIVERS NETWORK,

Petitioners,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY; ANDREW WHEELER, Acting Administrator, United States Environmental Protection Agency,

Respondents,

and

UTILITY WATER ACT GROUP,

Intervenor-Respondent.

Petition for Review of a Final Administrative Action of the United States Environmental Protection Agency

UTILITY WATER ACT GROUP'S RESPONSE BRIEF

Kristy A.N. Bulleit
Hunton Andrews Kurth LLP
2200 Pennsylvania Avenue, N.W.
Washington, DC 20037-1701
(202) 955-1547
kbulleit@huntonAK.com

Harry M. Johnson, III
Timothy L. McHugh
Hunton Andrews Kurth LLP
Riverfront Plaza, East Tower
951 E Byrd Street
Richmond, VA 23219-4074
(804) 788-8784
pjohnson@huntonAK.com
tmchugh@huntonAK.com

CERTIFICATE OF INTERESTED PERSONS

Clean Water Action, et al. v. U.S. Environmental Protection Agency, et al., No. 18-60079

The undersigned counsel of record certifies that the following listed persons and entities as described in the fourth sentence of Rule 28.2.1 have an interest in the outcome of this case. These representations are made in order that the judges of this Court may evaluate possible disqualification or recusal.

1. Petitioners: Clean Water Action, Environmental Integrity Project, Sierra Club, Waterkeeper Alliance, Inc., PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network

2. Intervenor-Respondent: Utility Water Act Group ("UWAG")

3. Respondents: United States Environmental Protection Agency; Andrew Wheeler, Acting Administrator, United States Environmental Protection Agency

4. Counsel for UWAG: Kristy A. N. Bulleit, Harry Margerum Johnson, III, and Timothy Louis McHugh, Hunton Andrews Kurth LLP

5. Counsel for United States Environmental Protection Agency and Andrew Wheeler: Martin F. McDermott and Tsuki Hoshijima, United States Department of Justice, and Jessica H. Zomer and Matthew Z. Leopold, U.S. Environmental Protection Agency.

6. Counsel for Sierra Club Only: Casey Roberts and Joshua D. Smith, Sierra Club

7. Counsel for Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.: Thomas J. Cmar, Earthjustice, and Matthew Gerhart

8. Counsel for Environmental Integrity Project, PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network: Gabriel Paul Clark-Leach, Environmental Integrity Project

9. Intervenor-Respondent UWAG is a voluntary, non-profit, unincorporated group of 145 individual energy companies and three national trade associations of energy companies. UWAG has no stock and no parent corporation, and no publicly held corporation owns a financial interest in the group.

UWAG will file a revised corporate disclosure statement should it become aware of a change in corporate ownership interests that would affect the disclosures.

Date: October 17, 2018

/s/ Harry M. Johnson, III
Harry M. Johnson, III
Counsel for Utility Water Act Group

STATEMENT REGARDING ORAL ARGUMENT

Petitioners and Respondents have both requested oral argument in this case. Pet'rs Br. at iii; EPA Br. at ii. Intervenor-Respondent UWAG respectfully submits that oral argument would assist the Court's consideration of this case, given its complex procedural history, including its close interrelationship with the issues and rulemaking under consideration by the Court in *Sw. Elec. Power Co. v. EPA*, No. 15-60821 (5th Cir.), and the importance of the issues at stake.

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Other Authorities

JURISDICTIONAL STATEMENT

Petitioners seek review of the Postponement Rule, 40 C.F.R. § 423.10 *et seq*., as amended, which relates directly to implementation of the U.S. Environmental Protection Agency's ("EPA's") steam electric effluent limitation guidelines ("ELGs"). This Court has exclusive jurisdiction to review ELGs pursuant to 33 U.S.C. § 1369(b)(1)(E).

STATEMENT OF ISSUES

1. Does EPA have authority under the Clean Water Act ("CWA") to revise compliance dates for ELGs when it receives information indicating that the existing ELGs are not achievable and when the regulated community will incur massive, irretrievable costs while EPA reconsiders those ELGs?

2. When EPA revises ELGs based on the previous rulemaking record and new information, may it focus on those factors under 33 U.S.C. § 1314(b)(2)(B) that are relevant to its limited revision, and rely on its previous assessment of the remaining factors for which no new information or comments were received?

3. Did EPA satisfy any applicable three-year deadline under the CWA for compliance with best available technology economically achievable ("BAT") limits, when it established a phased BAT implementation period requiring immediate compliance with the first phase of BAT limits, followed by compliance with the second phase "as soon as possible" after the necessary technology becomes available to plants?

4. Is the Postponement Rule subject to the CWA's requirement that compliance with an industry's initial BAT effluent limitations be achieved no later than "three years after they are promulgated … and in no case later than March 31, 1989"?

PERTINENT STATUTES AND REGULATIONS

The pertinent statutes and regulations are reproduced in the addendum to Petitioners' Brief.

STATEMENT OF THE CASE

I. CLEAN WATER ACT

EPA is required by statute to establish, periodically review and, "if appropriate," revise ELGs for point source discharges from existing facilities in various industries. 33 U.S.C. §§ 1311, 1314. ELGs are technology-based. EPA sets these technology-based limits by promulgating nationally uniform, primarily numerical regulations for industry categories or subcategories of dischargers. *See E. I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 121-22 (1977). Those limits and standards must be included in any National Pollutant Discharge Elimination System permit issued by EPA or a state permitting authority.

II. THE ELG RULE

EPA promulgated the ELG rule for the steam electric power generating sector on November 3, 2015. 80 Fed. Reg. 67,838 ("ELG Rule" or "2015 ELG Rule"). The Rule established several new, stringent effluent limitations applicable to the steam

electric power generation industry based on EPA's selection of the "best available technology economically achievable," or "BAT," under 33 U.S.C. §§ 1311(b)(2)(A) and 1314(b)(2)(B). Because BAT is "technology-forcing," *NRDC v. EPA*, 808 F.3d 556, 563-64 (2d Cir. 2015), EPA recognized that some of the Rule's advanced technologies were not immediately "available" to industry, and thus their corresponding BAT limits would not be immediately achievable. 80 Fed. Reg. at 67,854 ("[T]he final rule takes this approach in order to provide the time that many facilities need to raise capital, plan and design systems, procure equipment, and construct and then test systems."). The Rule therefore prescribed a range of dates within which the technologies would be deemed "available" and the effluent limits would be "achievable" for individual plants. The BAT limits would apply to point sources in the industry as soon as they are achievable, as determined by the plant's permitting authority. *Id.*

For flue gas desulfurization wastewater ("FGDW") and bottom ash transport water ("BATW"), the new BAT limits were to apply to individual plants "as soon as possible" after November 1, 2018, but no later than December 31, 2023. 40 C.F.R. §§ 423.13(g)(1)(i), 423.13(k)(1)(i). The "as soon as possible" determination is made by plants' permitting authorities because, EPA recognized, they are "in the best position to decide exactly when within th[e] implementation period particular technologies are available and achievable, in light of a consideration of certain factors that EPA has judged are relevant to the inquiry …." Index.10083 at 8-43. EPA therefore included

provisions in the ELG Rule requiring permit writers to determine the date on which the technologies would be available and the new limits could be met. 80 Fed. Reg. at 67,883; 40 C.F.R. § 423.11(t). Under the ELG Rule, the selected date becomes the applicability date of the effluent limitations (or, as sometimes called, the "compliance date").

EPA did not ignore BAT for the interim period before the future, more restrictive BAT limits would apply. The ELG Rule imposed separate "legacy wastewater" BAT limits that would apply immediately when the ELG Rule became effective. *Id.* at 67,854.

Legacy wastewater refers to any covered wastewater generated before a plant's "as soon as possible" date. Thus, the legacy wastewater BAT limits apply to FGDW and BATW (and other types of wastewaters) that are generated before the applicability dates for those wastestreams. EPA established the separate legacy wastewater limits expressly because it concluded that the technologies to treat individual wastestreams were not immediately available. Facilities needed time, EPA found, to modify their wastewater handling and treatment systems to comply with the new limits. *See id.* at 67,882-83 (discussing scope and scale of considerations plants were faced with to meet new limits). The sheer cost of the Rule, which is projected to cost industry billions, underscores the substantial steps that must be taken to come into compliance. *See id.* at 67,842 (estimated cost of $471-480 million annually).

III. CHALLENGES TO THE ELG RULE IN THIS COURT

The 2015 ELG Rule quickly became the subject of seven petitions for review that were consolidated in this Court. *Sw. Elec. Power Co. v. EPA*, No. 15-60821 (5th Cir.); Consolidation Order, *In re: EPA, "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category; Final Rule,"* MCP No. 136 (J.P.M.L. Dec. 8, 2015). Petitioners include UWAG, industry members, various environmental petitioners (including some of the Petitioners here), and two trade associations representing drinking water utilities.

In the ELG Rule litigation, UWAG and individual industry members raised serious challenges to the sufficiency of the data on which EPA relied when setting effluent limitations for two of the industry's major wastestreams: FGDW and BATW. Original Brief of Industry Petitioners, *Sw. Elec. Power Co.*, No. 15-60821 (5th Cir. Dec. 5, 2016), ECF No. 00513783903. Among other things, EPA ignored significant questions about whether the limits could be met with EPA's prescribed technologies, and whether EPA had any data to support those limits. *Id.* at 51-67. These questions went directly to whether BAT limits for FGDW and BATW would be achievable with the prescribed technologies.

IV. PETITIONS FOR RECONSIDERATION

After briefing commenced in the ELG Rule litigation, UWAG and the federal Small Business Administration ("SBA") filed petitions for administrative reconsideration of the 2015 ELG Rule. Index.12844 (UWAG Petition) (Mar. 24,

2017);[1] Index.12848 (SBA Petition) (Apr. 5, 2017). In addition to reiterating the arguments in the litigation, UWAG's petition included new information that was not available at the time EPA promulgated the 2015 ELG Rule. *See* 82 Fed. Reg. 19,005, 19,005 (Apr. 25, 2017) (noting overlap between litigation and new information). UWAG submitted the results of a new pilot study employing EPA's selected model technology for treating FGDW. This new study confirmed that the model technology could *not* meet the FGDW limits of the ELG Rule for certain power plants, just as UWAG was arguing in the ELG Rule litigation in this Court. Index.12844 at 5, 48-49, 61-65; Letter from UWAG to EPA Delivering Supplemental Information in Support of the UWAG Petition (EPRI Report), Index.12845 (Apr. 12, 2017); EPRI, Biological Treatment of Flue Gas Desulfurization Wastewater at a Power Plant Burning Power River Basin Coal – Pilot Demonstration ("EPRI Report"), Index.12846, and Appendix C to EPRI Report, Index.12847. UWAG also submitted data showing that EPA had seriously underestimated the cost of technologies it selected as model technologies for meeting the FGDW and BATW limits. Index.12844 at 49, 66-71.

After reviewing these petitions and the supporting information, the EPA Administrator informed UWAG and the SBA that "it is appropriate and in the public

[1] UWAG's Petition is properly listed in the Certified Index to the Administrative Record, but the description of its location in EPA's rulemaking docket appears to be a typographical error. *See* ECF No. 00514391500 at 929 (Index.12844)). In the official rulemaking docket, UWAG's Petition is found at EPA-HQ-OW-2009-0819-6478, not -6480. EPA-HQ-OW-2009-0819-6480 is supplemental information UWAG provided in further support of its Petition.

interest to reconsider the rule." Letter from EPA to Petitioners in Response to the Petitions for Agency Reconsideration and Stay of Effluent Guidelines for the Steam Electric Point Source Category, Index.12849 (Apr. 12, 2017).

In its Petition, UWAG also explained to EPA that the future applicability dates of the new, more stringent BAT limitations were causing imminent harm. Although the relevant provisions of the 2015 ELG Rule would not become applicable until November 1, 2018, at the earliest, UWAG reminded EPA that a rule of the magnitude and complexity of the ELG Rule requires substantial time and resources to come into compliance. Index.12844 at 3 (plants were being "forced to design, test, and try unproven technologies" to meet "EPA's overly ambitious assumptions about facilities' ability to comply with the limits imposed in the Rule."). Costly and detailed studies and planning, followed by large capital commitments and subsequent installation and testing, would be required. *Id.* Once made, these expenditures would be irretrievable if the 2015 ELG Rule were vacated on judicial review or revised by EPA. *E.g.*, *id.* at 76 n.203 (indirect dischargers were "in the process now of making costly [compliance] decisions that may be greatly affected by reconsideration"). As discussed below, UWAG provided EPA with specific examples of the harms that would befall the regulated community, its employees, and the electric utility rate-paying public, absent a stay or postponement of the "as soon as possible" dates.

a. <u>Massive Economic Impacts</u>

UWAG described the devastating economic impacts that the ELG Rule's impending applicability dates would have on the regulated community during reconsideration of the Rule if they were not stayed or extended. UWAG explained how one utility "estimated its costs of compliance to total approximately $308 million, with $41 million to be spent in less than one year and $178 million to be spent within 3 years." *Id.* at 67. Another utility "anticipate[d] that its total ELG costs will be approximately $200 million." *Id.* Likewise, another utility "included in its total projected environmental investments for 2018 through 2025 ELG Rule compliance costs ranging from $400-$550 million through 2023." *Id.*

UWAG also emphasized how "[s]maller, local utilities [we]re…experiencing high compliance costs relative to their lower numbers of ratepayers." *Id.* "To comply with the ELG Rule, City Utilities [of Springfield, Missouri] ha[d] already spent $4 million in capital costs and will need to spend an additional $3 million in capital costs if the 'zero discharge' BATW requirement stands, exclusive of additional annual operating costs." *Id.* at 68. UWAG explained further that it was especially important for EPA to suspend "the deadlines for indirect dischargers…because they face a hard deadline of November 1, 2018, to meet the PSES/PSNS standards for several waste streams. Accordingly, those dischargers [we]re in the process … of making costly decisions that may be greatly affected by reconsideration." *Id.* at 76 n.203; *see id.* at 68 n.184 (background on same).

b. Unit and Facility Closures

UWAG further described the serious potential for closures of electric generating plants and/or units. *Id.* at 68-69. As with many new significant environmental regulations, the ELG Rule was expected to cause closures. For example, UWAG cited plant closures caused by another major rule, EPA's Mercury and Air Toxics Standards rule: "In 2015, when EPA promulgated another rule affecting coal-fired power plants…, utilities were forced to retire almost 14 gigawatts of coal-fired generation. That represented more than 80% of all 2015 retirements. Similar impacts from the current batch of rules are likely." *Id.* (footnotes omitted).

c. Job Losses

The "natural consequence of unit and facility closures" is a loss of jobs. *Id.* at 69. UWAG also presented this basic concern in seeking applicability date relief from EPA. As UWAG explained, "[t]he ELG Rule's costs contribute to the threat of job losses, particularly when it is added on top of the impacts of other rules." *Id.* at 71. As an illustration, if environmental regulations forced one of the two units in Oliver County, North Dakota to shut down, it would cause a 40% reduction in employment at a local coal mine and would cause the local school district to lose 25% of its student population. *Id.* at 70. Similarly, if one plant in another location was forced to close by environmental regulations, it would cost local union members over $8 million in wages and benefits in 2016; closure of two units at another plant would mean loss of $13-14 million. *Id.* at 70-71.

EPA thus faced the following question about the ELG Rule's future deadlines. Why should utilities (and, by extension, their ratepayers) be forced to spend enormous sums pursuing technologies in an attempt to meet the ELG Rule's effluent limits when

- substantial questions had been raised about the legality of the Rule;
- compliance may not even be feasible because available information suggests the Rule's model technologies are not capable of meeting all the limits; and
- the Rule itself is under reconsideration due to the outstanding questions?

V. THE POSTPONEMENT RULE

EPA's response to these applicability-date concerns was two-fold. First, two weeks after deciding to reconsider the 2015 ELG Rule, EPA announced that it would temporarily stay all of the Rule's "compliance dates that have not yet passed," because "justice so required" under the Administrative Procedure Act ("APA"), 5 U.S.C. § 705. 82 Fed. Reg. at 19,005. This administrative stay was intended only to "preserve the regulatory status quo" until the Agency could engage in a notice-and-comment rulemaking. *Id.* The temporary stay is not at issue here. As explained below, EPA withdrew the stay and replaced it with the more narrowly tailored Postponement Rule, postponing only some of the ELG Rule's applicability dates, following notice-and-comment rulemaking. Petitioners' attack on the temporary administrative stay has no

bearing on the Postponement Rule, a regulation promulgated by EPA under the CWA.

The second phase of EPA's answer to the question was the Postponement Rule itself. On June 6, 2017, EPA proposed to revise the ELG Rule by "postpon[ing] the compliance dates for the new, and more stringent, best available technology economically achievable ('BAT') effluent limitations and pretreatment standards for each of the following wastestreams: Fly ash transport water, bottom ash transport water, flue gas desulfurization … wastewater, flue gas mercury control wastewater, and gasification wastewater." 82 Fed. Reg. 26,017, 26,017 (June 6, 2017). EPA accepted public comments on the proposed ELG revision until July 6, 2017, *id.*, and held a public hearing on July 31, 2017. 82 Fed. Reg. 43,494, 43,496 (Sept. 18, 2017).

On September 18, 2017, EPA finalized the Postponement Rule. *Id.* The final rule was different from the proposal in several respects, and much more narrowly focused. EPA changed the rule in response to certain commenters, including Petitioners. *Id.* at 43,498 ("Commenters stated that EPA has no basis to postpone compliance dates for requirements that parties have not expressly argued should be reconsidered …. EPA agrees …."); Index.13892 at 25 (Petitioners' comments). Unlike the proposed rule, the final rule left intact the applicability dates under the ELG Rule for fly ash transport water, gasification wastewater, and flue gas mercury control wastewater.

The Postponement Rule changed the compliance deadlines only for FGDW and BATW by modifying the earliest "as soon as possible" date. Specifically, EPA changed the earliest applicability date from November 1, 2018, to November 1, 2020. *Id.* at 43,500 (amending 40 C.F.R. §§ 423.11, 423.13, and 423.16). The Postponement Rule did not modify the ELG Rule's "no later than" compliance deadlines. Those deadlines remain December 31, 2023. 40 C.F.R. §§ 423.13(g)(1)(i) (FGDW), 423.13(k)(1)(i) (BATW).

When issuing the rule, the Agency stressed that the purpose of these changes was to allow permit writers to select "as soon as possible" dates that would avoid wasteful and futile expenditures. 82 Fed. Reg. at 43,496. Permittees would not be forced to expend resources on compliance with the new, more restrictive FGDW and BATW limits before the Agency has completed further rulemaking on the limits, which it expects to do by November 1, 2020. *Id.*

EPA's revision of the ELG Rule's applicability dates for FGDW and BATW had other practical and legal effects. Under the ELG Rule, plants must handle all FGDW and BATW generated *prior* to the applicable compliance date (*i.e.*, legacy wastewater) according to the Rule's legacy wastewater limits. 80 Fed. Reg. 67,838, 67,854 (Nov. 3, 2015). By postponing the earliest applicability dates for FGDW and BATW, the Postponement Rule did not change the numeric limits selected as BAT, but did modify the implementation period (*i.e.*, *when* permitting authorities may determine the limits will apply to those wastestreams). Those wastestreams will be

regulated as legacy wastewater for at most an additional two years, and a different BAT limit under the ELG Rule will apply in the intervening period.

After EPA's promulgation of the Postponement Rule, the parties filed a Joint Motion to Govern Further Proceedings in this Court. *Sw. Elec. Power Co.*, No. 15-60821 (5th Cir. Sept. 26, 2017), ECF No. 00514172056.[2] By order dated September 27, 2017, the Court approved the parties' proposed briefing schedule and plan for further proceedings. Order, *Sw. Elec. Power Co.*, No. 15-60821 (5th Cir. Sept. 27, 2017), ECF No. 00514172854. Industry petitioners' arguments regarding BATW and FGDW are still pending, but they have been severed and held in abeyance pending the outcome of EPA's reconsideration of those limits.

SUMMARY OF ARGUMENT

EPA has express authority and responsibility under the CWA to revise ELGs. In 2017, based on new information indicating that two stringent BAT limits may not be achievable or affordable, EPA announced it would reconsider those limits. Under the 2015 ELG Rule, industry was required to meet those limits as early as November 1, 2018. To avoid wasteful attempts to comply with those limits, EPA revised the earliest applicability dates in recognition that the limits may well change after

[2] On motion by EPA, the Court had earlier severed and held in abeyance those claims that were the subject of EPA's reconsideration of the ELG Rule. Order, *Sw. Elec. Power Co.*, No. 15-60821 (5th Cir. Aug. 22, 2017), ECF No. 00514126308. The Court directed the parties to confer and file a joint motion "setting forth a proposed revised briefing schedule for those issues that have not been severed and held in abeyance by the court." *Id.* at 2.

reconsideration by the Agency. Not only was EPA well within its statutory mandate, it acted as a responsible regulator under the circumstances. Both the CWA and common sense support the Postponement Rule. It averts imposing massive, potentially unnecessary compliance costs on electric utilities and the rate-paying public, and it prevents EPA's reconsideration from becoming a meaningless, hollow exercise.

EPA also took into account all of the statutory factors when issuing the Postponement Rule. The CWA requires EPA to take into account certain factors (including "such other factors" as it deems appropriate) when establishing BAT limits. Although Petitioners argue that EPA did not consider all the factors, they ignore the full record. The administrative record in this case verifies that EPA considered each of the factors. It includes EPA's assessment of the factors for the 2015 ELG Rule, plus consideration of additional factors in 2017 (most notably, EPA's reconsideration of the BAT limits at issue and the destructive costs that would be imposed without the Postponement Rule).

In the face of EPA's sensible action, Petitioners contend that EPA was required to mechanically restate its earlier analyses even if not relevant to the question at hand. But there was no legal or practical obligation for EPA to repeat the factors left unchanged by the Postponement Rule and already discussed in the record. EPA provided further explanation for its analysis of the factors pertinent to its revision of the applicability dates. Among others, the Agency expressly considered the costs of

achieving effluent reduction (*i.e.*, of requiring compliance) and process/engineering changes (*i.e.*, those that would be necessary if the Postponement Rule were not issued).

In any event, Petitioners waived the issue of EPA's purported failure to consider all the statutory factors. The issue was not raised during the public comment period and therefore cannot be raised for the first time in this judicial challenge to the Agency's action.

EPA also satisfied any arguable requirement that compliance with BAT limits must be achieved within three years after promulgation. The Postponement Rule leaves in place the two-phased BAT implementation period established by the 2015 ELG Rule. The first phase includes BAT limits that became applicable immediately, and the second phase includes new and more stringent BAT limits that become applicable once the permitting authorities determine the technologies are available to individual facilities. While the second phase may take more than three years under the Postponement Rule, the first phase BAT limits apply in the interim. As this Court has repeatedly held, EPA has considerable leeway in fashioning how BAT limits will be incorporated into ELGs. The Agency exercised its discretion reasonably here.

Finally, even though the Postponement Rule in fact requires compliance with BAT limits within three years of its promulgation, the CWA does not require it to do so. The plain language, context, and legislative history of the CWA's three-year provisions make clear that they were intended to apply only to EPA's *initial*

promulgation of BAT limits for classes or categories of point sources. Congress demanded that EPA require compliance with initial BAT limits within three years of their promulgation "and in no case later than March 31, 1989." EPA satisfied these requirements for the steam electric power generating sector long ago when it promulgated BAT limitations for the industry. EPA's subsequent revisions to BAT limits, including those at issue in this case, are not subject to any requirement to ensure compliance within three years and in no case later than March 31, 1989.

STANDARD OF REVIEW

The Court's review of EPA's interpretation of the CWA is governed by *Chevron, U.S.A. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837 (1984). *Chevron* articulates a two-step test for judicial review of agency's statutory interpretations. First, the reviewing court must ask "whether Congress has directly spoken to the precise question at issue." *Id.* at 842. If so, "that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress." *Id.* at 842-43. If Congress has not directly spoken to the issue at hand, however, the Court must decide if the agency's action under the statute is based on a permissible construction of the statute. *Id.* at 843. In this second step, the court must accord considerable weight to the agency's construction of the statute and it may not substitute its own construction of the statute for the agency's reasonable interpretation. *Id.* at 843-44.

EPA promulgated the Postponement Rule after notice-and-comment rulemaking. As such, the Court's review of EPA's exercise of discretion in doing so is governed by 5 U.S.C. § 706(2) of the APA. *Texas Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 936 (5th Cir. 1998). Under § 706(2), the Court must invalidate a regulation if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law"; "in excess of statutory jurisdiction, authority, or limitations, or short of statutory right"; or "without observance of procedure required by law." 5 U.S.C. § 706(2)(A), (C), (D). An agency's promulgation of a regulation is "arbitrary or capricious"

> if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.

Motor Vehicle Ass'n v. State Farm Mut. Auto. Ins. Co. ("*State Farm*"), 463 U.S. 29, 43 (1983).

The Court is required to make a "searching and careful review" in its assessment of agency action, but "the ultimate standard of review is a narrow one." *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416 (1971). "If the agency's reasons and policy choices conform to minimal standards of rationality, then its actions are reasonable and must be upheld." *Tex. Oil & Gas*, 161 F.3d at 934. "A reviewing court must be 'most deferential' to the agency where, as here, its decision is based upon its evaluation of complex scientific data within its technical expertise."

BCCA Appeal Grp. v. EPA, 355 F.3d 817, 824 (5th Cir. 2003), *as amended on denial of reh'g and reh'g en banc* (Jan. 8, 2004) (quoting *Baltimore Gas & Elec. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 103 (1983)).

ARGUMENT

I. EPA HAD AMPLE AUTHORITY TO PROMULGATE THE POSTPONEMENT RULE

Petitioners argue that EPA lacked statutory authority to promulgate the Postponement Rule. Not so. The CWA *expressly* authorizes and requires EPA to review and revise existing ELGs, "as appropriate." 33 U.S.C. §§ 1311(d) (effluent limitations at least every five years), 1314(b) (guidelines at least every year), (g)(1), (m)(1)(A), 1317(b)(2)).[3] EPA cited these provisions as its authority for promulgating the Postponement Rule. 82 Fed. Reg. at 43,496.

The EPA Administrator also is generally "authorized to prescribe such regulations as are necessary to carry out his functions under this chapter." 33 U.S.C. § 1361(a). Petitioners do not dispute that an agency is free to reconsider, revise, or

[3] *See also* S. Rep. No. 92-414 (1972), *reprinted in* 1972 U.S.C.C.A.N. 3668, 3751 ("[I]t would not be in the public interest to measure for all time the adequacy of a promulgation of any standard requirement or regulation by the information available at the time of such promulgation. … [I]t is clear that new information will be developed and that such information may dictate a revision or modification of any promulgated standard, requirement, or regulation established under the [CWA]."); H.R. Conf. Rep. 99-1004 (Oct. 15, 1986) at 123 (the conferees "recognize that, where the record is already closed and an applicant has new information to present bearing on the guideline or standard, the applicant continues to have the right to petition the Administrator to reopen the rulemaking and record and consider creation of a subcategory"); 5 U.S.C. § 553(e) (giving "interested person[s] the right to petition for the issuance, amendment, or repeal of a rule").

repeal an existing regulation — that much is black letter administrative law. *E.g.*, *ConocoPhillips Co. v. EPA*, 612 F.3d 822, 832 (5th Cir. 2010) ("Embedded in an agency's power to make a decision is its power to reconsider that decision.").[4] Instead, they attempt to minimize EPA's express authority under the CWA to revise ELGs by questioning EPA's authority to "stay" ELGs while reconsidering them. This conveniently ignores that the Postponement Rule is an ELG revision that is the product of notice-and-comment rulemaking, not an administrative stay. Moreover, as a fundamental matter, it conflates Petitioners' challenge to EPA's *authority* to revise ELGs generally with their challenge to EPA's *basis* for doing so in the Postponement Rule. There can be no doubt as to EPA's authority to revise ELGs.

In *Association of Pacific Fisheries v. EPA*, 615 F.2d 794 (9th Cir. 1980), future Justice Kennedy described the CWA's ELG revision provisions. As Judge Kennedy explained, the revision provisions require EPA to "justify" and "review" existing ELGs in light of new or "more extensive data developed since the regulations were first promulgated." *Id.* at 812. Indeed, these provisions can be triggered, "[i]n an appropriate case," by "a petition for reconsideration … to consider whether [new] evidence … requires the Agency to review its original actions." *Id.* Under these

[4] *See also Luminant Generation Co. LLC v. EPA*, 714 F.3d 841, 857-58 (5th Cir. 2013) (EPA not required to compound mistakes "for the sole purposes of consistency"); *La. Pub. Serv. Comm'n v. FERC*, 761 F.3d 540, 554 (5th Cir. 2014) (deferring to changed policy based on FERC's exercise of its "technical and factual expertise to interpret" ambiguous language); *Chevron*, 467 U.S. at 863-64 (deferring to EPA's flexible interpretation of statutory term "in the context of implementing policy decisions in a technical and complex arena").

authorities, EPA had the power, if not the responsibility, to issue the Postponement Rule.

Moreover, in *State Farm*, the Supreme Court expressly recognized a general agency authority "to temporarily suspend … or to delay [the] implementation date" of an existing rule while the agency reconsiders it in light of new information. 463 U.S. at 50 n.15. The Supreme Court reasoned this was not only permissible, it was *preferable* to outright rescission of an existing rule (there, a national safety standard), when the agency believes that new information warrants "avoid[ing] forcing manufacturers to spend resources to comply with an ineffective safety initiative." *Id.*[5] These statements in *State Farm* are significant, as the case is oft-cited for the principle that agency decisionmaking must be based "on a consideration of the relevant factors." *See supra.* Indeed, Petitioners cite it for just that proposition here. Pet'rs Br. 38. *State Farm* thus contemplates that agencies can reconsider their rules, based on a consideration of the relevant factors, while simultaneously delaying the implementation of the rule under reconsideration.

Association of Pacific Fisheries and *State Farm* confirm EPA's authority to issue the Postponement Rule. EPA relied specifically on "serious concerns about the availability and affordability of the technology basis for" the ELG Rule's BAT limits, which "overlap[ped] with the claims in the ongoing litigation challenging the Rule in"

[5] Similar to the situation here, the organic statute at issue in *State Farm* allowed the agency to revoke as well as establish standards. *Id.* at 41.

this Court. 82 Fed. Reg. at 43,496; 82 Fed. Reg. at 19,005. Industry challenged EPA's promulgation of the ELG Rule, in part based on objections to EPA's flawed methodologies and to EPA's lack of data demonstrating that certain new effluent limitations were even achievable. For example, industry noted that EPA had no data showing that plants burning subbituminous or lignite coal — representing up to *25%* of the industry — could meet the new FGDW limitations using the treatment technology on which EPA modeled the limits. Index.12844 at 18, 21, 23, 29, 32 (citing Original Brief of Industry Petitioners, *Sw. Elec. Power Co. v. EPA*, No. 15-60821 (5th Cir. Dec. 5, 2016), ECF No. 00513783903).[6]

EPA also considered new data demonstrating that industry's fears were well-founded. UWAG presented the Agency with new data showing the FGDW and BATW effluent limitations were neither economically nor technologically achievable. Index.12844 at 32-49 (FGDW), 49-61 (BATW).

After reviewing the petitions and data, the EPA Administrator concluded that "it is appropriate and in the public interest to reconsider the [ELG] rule." Index.12849. While conceding no error, the Administrator also recognized that "the far-ranging issues contained in the reconsideration petitions warrant careful and considerate review of the Rule." 82 Fed. Reg. at 19,005. The Administrator

[6] As the industry petitioners' brief further explained, subbituminous and bituminous coals have vastly different characteristics and therefore pollutant matrices when burned. EPA gathered data on the effectiveness of its model treatment technology only for plants burning bituminous coal. Original Brief of Industry Petitioners at 53-55.

subsequently issued the Postponement Rule, explaining further that the UWAG and SBA petitions raised "serious concerns about the availability and affordability of the technology basis for the [FGDW] and [BATW] requirements in the 2015 Rule," and that these "are important issues that warrant further consideration." 82 Fed. Reg. at 43,496-97. At all steps along the way, EPA kept this Court informed of its actions, and the Court ultimately ordered all industry challenges to the ELG Rule severed and held in abeyance pending completion of EPA's reconsideration proceedings. Order, *Sw. Elec. Power Co. v. EPA*, No. 15-60821, ECF No. 00514126308.

EPA's actions here are a model of responsible and responsive regulation. Faced with the precise circumstances contemplated in *Association of Pacific Fisheries* and *State Farm*, EPA was well within its authority under the CWA to revise the ELG Rule and prevent its reconsideration from becoming a meaningless, hollow exercise. Its authority to promulgate an ELG revision is evident under the plain language of the CWA, case law, and basic principles of administrative law.

Petitioners attempt to counter by citing cases and statutes unrelated to the CWA or to EPA's express authority to revise ELGs. Pet'rs Br. 30-33.[7] As EPA explains in its brief, these have no bearing on the Postponement Rule, as they involve

[7] Petitioners spend more than half of this discussion on EPA's authority to promulgate an administrative stay under 5 U.S.C. § 705, a provision of the APA. Pet'rs Br. 31-33. These arguments are irrelevant. EPA did not purport to act under § 705 when it issued the Postponement Rule.

"'different statutory schemes and … different rules.'" EPA Br. 19 (quoting *NRDC v. NHTSA*, 894 F.3d 95, 111 (2d Cir. 2018)).

Moreover, EPA here correctly interpreted 33 U.S.C. §§ 1311(d), 1314(b), (g)(1), (m)(1)(A), and 1317(b)(2) as providing it with the authority to revise ELGs, "as appropriate." 82 Fed. Reg. at 43,496. The CWA is admittedly "among the most complex" statutes, "balanc[ing] a welter of consistent and inconsistent goals." *Catskill Mountains Chapter of Trout Unlimited, Inc. v. City of New York*, 273 F.3d 481, 494 (2d Cir. 2001), *adhered to on reconsideration*, 451 F.3d 77 (2d Cir. 2006). But here, the statute is clear. EPA was correct to interpret the CWA to allow the Agency to revise ELG applicability dates "as appropriate."

II. EPA CONSIDERED ALL RELEVANT FACTORS IN ISSUING THE POSTPONEMENT RULE

Separate from the question of EPA's authority under the CWA to revise ELG applicability dates — which EPA unequivocally possesses — is the question of the factors it is required to consider when doing so. *State Farm*, 463 U.S. at 43 (in reviewing agency's explanation "we must consider whether the decision was based on a consideration of the relevant factors") (internal quotation and citation omitted). Petitioners argue EPA was required to consider all of the factors listed under 33 U.S.C. § 1314(b)(2)(B), which apply to new or revised BAT limitations. Pet'rs Br. 34-39. As explained below, EPA considered all of the necessary factors, but in any event Petitioners waived this argument by failing to present it to EPA in comments.

a. <u>EPA Took Into Account All § 1314(b)(2)(B) Factors</u>

Even if Petitioners preserved their § 1314(b)(2)(B) argument, which they did not, EPA took into account all of the factors called for by the statute. This is because the nature of EPA's obligation to consider and explain the § 1314(b)(2)(B) factors is necessarily dictated by the extent of the Postponement Rule's changes to the ELG Rule. *Cf. Schiller v. Tower Semiconductor Ltd.*, 449 F.3d 286, 297 & n.10 (2d Cir. 2006) (noting uncertainty surrounding "whether an agency must follow APA procedures with respect to that part of an amended rule that does not undergo any change") (citing, among others, *United States v. Garner*, 767 F.2d 104, 121 (5th Cir. 1985)).

The Postponement Rule revises the ELG Rule in only one way. It changes the earliest "as soon as possible" applicability date for ELGs for two wastestreams from November 1, 2018, to November 1, 2020. EPA accomplished this with two limited alterations in the regulatory language. First, it amended 40 C.F.R. § 423.11(t) to provide "[t]he phrase 'as soon as possible' means November 1, 2018 *(except for purposes of § 423.13(g)(1)(i) and (k)(1)(i), and § 423.16(e) and (g), in which case it means November 1, 2020)*, unless the permitting authority establishes a later date, …" 82 Fed. Reg. at 43,500 (change in italics). Then, it amended §§ 423.13(g)(1)(i), (k)(1)(i), and 423.16(e) and (g) "by removing the text 'November 1, 2018' and adding the text 'November 1, 2020' in its place." *Id.* The Postponement Rule expressly "does not otherwise amend" the ELG Rule. *Id.* at 43,494.

EPA's prior consideration of the § 1314(b)(2)(B) factors is explained in the preamble to the ELG Rule and throughout the rulemaking record here. *E.g.*, 80 Fed. Reg. at 67,848-56; *see* Index.10078 at 3-331 (directing reader to preamble Section VIII "regarding application of [BAT] criteria in the final rule"). These findings are undeniably part of the Postponement Rule record. *See* Notice of Filing Certified Index to the Admin. Record, ECF No. 00514391500 (including ELG Rule record in Postponement Rule record). *See also* Pet'rs Br. 36 (acknowledging EPA's recitation of the BAT factors in the Postponement Rule record, but characterizing recitation as "lip service"). Notably, Petitioners did not challenge – and still do not criticize – how EPA weighed the factors when setting the BAT limitations for FGDW and BATW in the 2015 ELG Rule. Petitioner simply invite this Court to ignore what EPA did.

The record for the Postponement Rule satisfies any requirement that EPA consider the prescribed factors. EPA was not writing on a blank slate. The Postponement Rule is a "sequential regulation" that "arise[s] from the same administrative background and cumulative record" as the 2015 ELG Rule. *BASF Wyandotte Corp. v. Costle*, 582 F.2d 108, 112 (1st Cir. 1978) (considering ELG revisions). As such, EPA's consideration of the BAT factors in the ELG Rule rulemaking can and must be considered when reviewing the Postponement Rule because EPA's BAT determinations are part of the record here.[8] *E.g.*, *Budhathoki v.*

[8] Petitioners misconstrue EPA's statement that it will consider the statutory factors during reconsideration of the ELG Rule. Pet'rs Br. 37. Petitioners argue that

Nielsen, 898 F.3d 504, 517 (5th Cir. 2018) ("focal point for judicial review" is documents that are "part of the administrative record") (citing *Camp v. Pitts*, 411 U.S. 138, 142 (1973)).

Despite Petitioners' assertion that EPA was required to make "new" findings on each factor for the Postponement Rule, Pet'rs Br. 36-37, nothing in the statute or case law requires EPA to mechanically repeat all its prior analyses without regard to their relevance to the question at hand. During the public comment period (and even now), Petitioners provided no new information to EPA concerning those factors, much less how those factors might weigh against postponing the earliest applicability dates.

In addition to the BAT factors that it had previously considered, EPA took into account the factors relevant to the modification of applicability dates, based on changed circumstances and new information. Most importantly, EPA considered that it had "decided to undertake a new rulemaking, which may result in substantive changes to the 2015 Rule." 82 Fed. Reg. at 43,496. EPA further recognized the exorbitant and potentially wasted costs that would be expended during the reconsideration period, including the effects of those costs on utility ratepayers. *Id.* at

this is an admission that those factors were not considered here. That is a *non sequitur*. Of course EPA must reconsider the BAT factors when and if it establishes new BAT limitations for FGDW and BATW on reconsideration. But that has no bearing whatsoever on the factors that EPA took into account in the record for the Postponement Rule, which is a distinct rulemaking from the reconsideration of the ELG Rule.

43,497. EPA prepared and considered analyses of the forgone effluent reductions and corresponding social benefits. *Id.* at 43,497-98.

The CWA expressly authorizes EPA to consider such relevant factors. 33 U.S.C. § 1314(b)(2)(B) (requiring EPA to take into account "such other factors as the Administrator deems appropriate").[9] EPA gave this factor substantial weight, which is well within its discretion under the CWA. *Texas Oil & Gas*, 161 F.3d at 928 (EPA "has considerable discretion in evaluating the relevant factors and determining the weight to be accorded to each….").

Moreover, consistent with the legal authorities discussed above, EPA did effectively consider each of the statutory factors implicated by the Postponement Rule. EPA considered the "cost of achieving such effluent reduction" that would be forgone under the Postponement Rule. After discussing its estimates and evaluations of costs to comply with the ELG Rule, EPA concluded "[i]n light of these imminent planning and capital expenditures that facilities incurring costs under the 2015 Rule would need to undertake in order to meet the earliest compliance deadlines for the new, more stringent limitations … it [i]s appropriate to postpone the earliest compliance dates." 82 Fed. Reg. at 43,497. It also considered the "process employed," "engineering aspects of the application of various types of control

[9] Congress recognized that it could not foresee all the factors that EPA would reasonably take into account in setting nationally uniform BAT limitations, so it included the catch-all, "such other factors as the Administrator deems appropriate." This broad discretion must be exercised reasonably, but Petitioners cannot deny that the statute itself confers such discretion.

techniques," and "process changes" that would not be required under the Postponement Rule, explaining that its earlier analyses "identified equipment and process changes that the plant[s] would likely make to meet the 2015 Rule," "such as installing concrete foundations and buildings for … new equipment," and "connecting electrical and piping systems to new equipment." *Id.* Each of these is a factor under § 1314(b)(2)(B).[10]

EPA was reasonable to highlight the BAT factors implicated by its reconsideration of the ELG Rule and by the new information it had received. Certainly, EPA's action conformed to "minimal standards of rationality." *Baylor Cty. Hosp. Dist. v. Price*, 850 F.3d 257, 264-65 (5th Cir. 2017) (agency's choice and weighting of factors conformed to minimal standards of rationality, where agency could have resolved statutory ambiguity "in any number of ways" and agency's interpretation "more closely aligns with the [statutory] text than the intent-based or purposive reading proffered by" petitioner). There is no principle of law that says, particularly under the circumstances here, EPA must reconsider and restate every aspect of its earlier decision, even those aspects that are unchanged or unaffected. Indeed, Petitioners have never explained how the unchanged factors might have affected EPA's ultimate decision to postpone applicability dates. In any event, the law is clear

[10] The other § 1314(b)(2)(B) factors, such as the "age of equipment and facilities involved," are not implicated by the Postponement Rule. It is telling that Petitioners have offered nothing to suggest that such factors would be germane to EPA's evaluation of the Postponement Rule.

that EPA may find that one statutory factor outweighs all others. *E.g.*, *Texas Oil & Gas*, 161 F.3d at 934.

Petitioners, while unhappy with EPA's decision to grant petitions to reconsider the FGDW and BATW limits of the ELG Rule, cannot show that EPA violated the CWA by deciding that it should not require compliance with those limits in the interim, in light of the significant costs, process and engineering changes, and other impacts such compliance would require.

b. <u>Petitioners Waived Their § 1314(b)(2)(B) Challenge By Failing to Present it to the Agency During Notice-And-Comment Rulemaking</u>

Petitioners jointly submitted 58 pages of substantive comments and hundreds of pages of exhibits in response to EPA's proposal to issue the Postponement Rule. Index.13892 *et seq*. Some Petitioners also joined other comments, attaching hundreds more pages of exhibits. Index.13938 *et seq*. (submitted on behalf of Sierra Club and Waterkeeper Alliance, among others). All Petitioners participated in a public hearing on the proposed rule, as well. Index.12852. At no point during EPA's administrative proceedings, however, did Petitioners or anyone else argue that EPA failed to consider all of the BAT factors under 33 U.S.C. § 1314(b)(2)(B). As such, their challenge to the Postponement Rule on that basis is waived. *Texas Oil & Gas*, 161 F.3d at 932 n.7; *BCCA*, 355 F.3d at 828-29 & n.10; *Myron v. Martin*, 670 F.2d 49, 51 (5th Cir. 1982).

To be sure, Petitioners generally alluded to § 1314(b) at points in their comments. *E.g.*, Index.13892 at 3 (discussing purported three-year compliance deadline for BAT limits). And they argued that EPA's conclusions in the 2015 ELG Rule should not be reconsidered. *E.g.*, *id.* at 37-38 (arguing industry's concerns about EPA's analysis of cost-effectiveness for BATW unfounded and should not affect EPA's underlying BAT determination). But these general comments nowhere mentioned the argument now being offered in this Court for the first time – that the Agency was required to revisit and restate all BAT factors regardless of whether they are related to the proposed change in applicability dates. The comments were insufficient to put EPA on notice of this purported flaw, thereby depriving the Agency of the opportunity to take a position and/or correct itself before taking final action. "Practical notions of judicial efficiency, administrative autonomy and encouraging effective agency procedures" therefore caution against having this Court decide the issue in the first instance. *Myron*, 670 F.2d at 51.[11]

Indeed, Petitioners' arguments here are *at odds* with the position they took in their comments to EPA. *Bass v. USDA*, 211 F.3d 959, 964 (5th Cir. 2000) (rejecting argument that challenge had been "'inartfully' alluded to … in a letter to the agency"). Petitioners told EPA precisely what, in Petitioners' view, EPA was required to

[11] Tellingly, Petitioners do not claim in their opening brief that they (or anyone else) commented to EPA that it must reconsider all of the § 1314(b)(2)(B) factors or provided any information on which such reconsideration might be based. As a result, they cannot (and do not) argue that EPA failed to respond to comments in this regard.

consider, and it did *not* include the BAT factors that they now seek to rely on. *See, e.g.,* Index. 13892 at 8. Petitioners argued to EPA that "the costs (forgone benefits) of postponing the ELG deadlines must be considered alongside the purported (but unquantified) benefits of the proposed postponement (in the form of avoided expenditures by power plant operators)." *Id.* As a result, EPA considered exactly that, in addition to the factors discussed above. Index.12860 at 3-6 (responding to comments that EPA should consider "that postponement … will lead to lost human health and environmental benefits that would have accrued," among other things). Nowhere in Petitioners' comments do they mention revisiting all the § 1314(b)(2)(B) factors as a requirement of issuing the Postponement Rule.

Because Petitioners did not present their § 1314(b)(2)(B) argument to EPA, it is waived.

III. THE CWA'S THREE YEAR PROVISIONS ARE NOT IMPLICATED BY THE POSTPONEMENT RULE

a. EPA Satisfied Any Three-Year Requirement By Establishing a Two-Phased BAT Implementation Period Under the ELG Rule

Petitioners next argue that the Postponement Rule fails to require compliance with new BAT limitations within three years of its promulgation. Pet'rs Br. 39-48. Petitioners base this argument on their reading of 33 U.S.C. § 1311(b)(2), which provides:

> there shall be achieved … compliance with [BAT] effluent limitations in accordance with subparagraph (A) of this paragraph as expeditiously as practicable but in no case

> later than three years after the date such limitations are promulgated …, and in no case later than March 31, 1989.

33 U.S.C. § 1311(b)(2)(C), (D), (F).

As EPA correctly argues in its brief, the ELG Rule established a two-phased BAT implementation period that makes legacy wastewater BAT limits immediately effective. EPA Br. 28-30. These BAT limits apply today — *i.e.*, within three years of the ELG Rule's promulgation — to every wastestream regulated by the ELG Rule, and they are unaffected by the Postponement Rule.[12] Thus, under the Postponement Rule, every wastestream must comply with BAT limits now. Therefore, Petitioners cannot legitimately argue that any three-year compliance requirement has been violated.

The ratcheting down of BAT limitations over time is both permissible and reasonable under the statute. This Court has recognized that "EPA has significant leeway in determining *how* the BAT standard will be incorporated into final ELGs." *Texas Oil & Gas*, 161 F.3d at 928 (emphasis added); *see also E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 132 (1977) ("Considerations of feasibility and practicality are certainly germane" to the issue of construing EPA's authority to promulgate

[12] The ELG Rule became effective on January 4, 2016 (80 Fed. Reg. at 67,838), and Petitioners did not challenge the two-phased implementation period in their original petition challenging the ELG Rule. Opening Brief of Petitioners Environmental Integrity Project, Sierra Club, and Waterkeeper Alliance, Inc. at 36-54, No. 15-60821, ECF No. 00513785014 (arguing that the phase one limits should be more stringent, but not that EPA lacked authority to require two-phased implementation or that compliance with the phase two limits must be achieved within three years of their promulgation).

ELGs). Moreover, EPA had compelling reasons to phase in the most stringent BAT limits in the ELG Rule: "EPA determined that certain technologies are not available and achievable until at least November 1, 2018, but that all of those technologies are available and achievable by December 31, 2023." Index.10083 at 8-43.[13] EPA established the two-phased BAT implementation period, "to provide the time that many steam electric power plants need to raise capital, plan and design systems, procure equipment, and construct and then test systems." *Id.* at 8-45 (also discussing allowing for consideration of plant changes due to other rules, planned shutdown/maintenance periods, maintenance of grid reliability). The first phase requires compliance with legacy wastewater BAT limitations. Index.12860 at 9. "Then, beginning as early as 2018, there are new, more stringent limitations that apply to plants … ." *Id.* The Postponement Rule changes the 2018 date to 2020, but this means only that the legacy wastewater BAT limits of the initial phase may apply longer.

In promulgating both the 2015 ELG Rule and the Postponement Rule, EPA correctly interpreted the CWA as authorizing it to take this two-phased approach to BAT limits. Index.10083 at 8-129 ("EPA disagrees that the implementation period in the final rule is inconsistent in any way with the Clean Water Act … In some cases, the rule establishes limitations that are based on technologies that are available as of

[13] The Postponement Rule did not change this outermost 2023 deadline. 82 Fed. Reg. at 43,496.

the date of this final rule … In other cases, the rule establishes limitations based on technologies that EPA determined are not available until at least November 1, 2018 ….”); Index.12860 at 9.

EPA's interpretation is consistent with the well-settled principle that BAT determinations are supposed to be "technology-forcing." *Chem. Mfrs. Ass'n v. NRDC*, 470 U.S. 116, 155-56 (1985); *see Texas Oil & Gas*, 161 F.3d at 927 ("The CWA prescribes progressively more stringent technological standards…."). In the ELG Rule, EPA determined that specific advanced technologies were not *currently* available, but would become available in the future. Because BAT limitations must be based on the "best *available* technology," 33 U.S.C. § 1314(b)(2)(B) (emphasis added), EPA would be precluded from imposing BAT based on a technology that is not yet available in the absence of a phased approach. By contrast, under Petitioners' distorted reading of the statute, EPA would not be permitted to establish progressively more restrictive BAT limits unless technologies are available within three years. EPA's interpretation is not only more reasonable, it is correct.

Petitioners offer nothing to show that EPA's interpretation is inconsistent with the language of the statute. Instead, they merely assert that "EPA cannot cure its violation of the statute regarding some effluent limitations by pointing to its compliance with respect to other effluent limitations." Pet'rs Br. 42. Notably, however, neither Petitioners nor any other party challenged the 2015 ELG Rule's two-phased implementation period in the consolidated proceedings to review the Rule in

this Court, lending support to EPA's continued position here. *NRDC v. EPA*, 25 F.3d 1063, 1073 (D.C. Cir. 1994) ("An agency seldom acts arbitrarily when it acts in conformity with its unchallenged rules.").[14]

b. <u>The Clean Water Act's Three-Year Provisions Applied Only to EPA's Initial Development of BAT Limitations</u>

There is a second, independent reason to reject Petitioners' arguments about a purported three-year compliance deadline. Although EPA required compliance with the ELG Rule's BAT limits within three years, it was not required to do so. Petitioners quote 33 U.S.C. § 1311(b)(2) and assert that a literal reading of the provision mandates compliance with BAT limitations within three years of promulgation under all circumstances. Pet'rs Br. 39-40. But the statute also says "and *in no case* later than March 31, 1989." 33 U.S.C. § 1311(b)(2)(C), (D), (F) (emphasis added). *See Chem. Mfrs. Ass'n v. EPA*, 870 F.2d 177, 242 (5th Cir. 1989) (enforcing March 31, 1989 deadline). If, as Petitioners contend, EPA was bound by § 1311(b)(2)(C), (D), and (F)'s deadlines in this rulemaking, the Agency was required in 2015 and again in 2017 to require compliance before March 31, 1989. That cannot be a proper interpretation.

[14] As such, even if the Court were to vacate the Postponement Rule, permitting authorities would still be free to not impose the ELG Rule's new, more stringent BAT limits until as late as 2023, and they could take into account EPA's pending reconsideration of those BAT limits. *See* 40 C.F.R. § 423.11(t) (allowing permitting authorities to consider "[o]ther factors as appropriate" when deciding "as soon as possible" date). Petitioners effectively concede as much. Pet'rs Br. 41 n.14.

There is one — and only one — logical interpretation that harmonizes the language. Section 1311 required compliance within three years, and no later than March 31, 1989, for effluent limitations promulgated *before* March 31, 1989. Indeed, the context confirms that the statute was referring to the *initial* effluent limitations for a class or category of point sources, not to later, post-1989 revisions to those limitations on the basis of advancing technologies.

Subparagraph (A) covers "effluent limitations for *categories and classes of point sources*." *Id.* § 1311(b)(2)(A) (emphasis added). Coupled with the 1989 deadline, which as discussed below was revised over time as EPA struggled to develop BAT limits for all point source categories, the deadlines under § 1311(b)(2) were intended only to force EPA's initial development of nationwide BAT limitations for point source categories. They do not have implications for subsequent revisions to BAT limits, such as those in this case.

The legislative history of the CWA supports this reading of the statute. While the statute today reflects a three-year/1989 deadline, it was previously amended several times as Congress pushed EPA to complete the initial BAT limitations for all point source categories. As originally enacted, the statute required EPA to promulgate BAT limits for all point source categories "not later than July 1, 1983." Pub. L. 92-500, § 2, Oct. 18, 1972, 86 Stat. 845 (codified then under 33 U.S.C. § 1311(b)(2)(A)). This requirement was amended in 1977 to impose a deadline of three years after promulgation, but "not later than July 1, 1984." Pub. L. 95-217, § 42, 91

Stat. 1566. The current version of the statute was enacted in 1987, giving yet another extension to the deadline as EPA struggled to promulgate BAT limits for the remaining industries. Pub. L. 100-4, 101 Stat. 7.

The Conference Report on the 1987 amendment reflects Congress's particular focus on ensuring that all industrial point source categories were subject to initial BAT limitations as quickly as possible. There, Congress noted that it decided to establish discrete deadlines to force EPA to develop BAT limitations for "the two remaining categories of industrial discharges for which no such limitations have been established." H.R. Conf. Rep. No. 99-1004, at 115 (Oct. 15, 1986).

Soon thereafter, this Court had occasion to review the BAT limitations for one of the industrial point source categories contemplated in the Conference Report. In *Chemical Manufacturers Association*, the Court rejected the industry's challenges to the sufficiency of the lead time available to come into compliance with its new BAT limits. 870 F.2d at 242 (ELGs for organic chemicals, plastics, and synthetic fibers manufacturing category). Congress had set the March 1989 deadline for those initial ELGs, and the Court enforced it. The Court relied on the Conference Report, which explained that "'[i]f dischargers in an *entire category* are unable to meet the March 31, 1989 deadline … as a result of the Administrator's failure to promulgate effluent limitations in sufficient time,'" relief from the BAT limits was still possible. *Id.* (quoting H.R. Conf. Rep. No. 99-1004) (emphasis added). The Court therefore

enforced the statutory requirement that the industry comply with the new BAT limits by March 31, 1989. *Id.*

It is clear from the Court's discussion in *Chemical Manufacturers Association* that its holding does not impose a three-year compliance (or March 31, 1989) deadline for all future ELGs. The Court did not, as Petitioners argue, decide "that EPA lacks discretion to extend compliance deadlines for BAT limits beyond the three year outer bound set forth in the statute." Pet'rs Br. 40 n.13. The Court enforced *only* the deadline of March 31, 1989. *Chem. Mfrs. Ass'n*, 870 F.2d at 242. Notably, Petitioners point to no case that has enforced a three year deadline on new BAT limits post-1989. It is obviously impossible for a discharger to comply with a BAT limit promulgated in 2017 "no … later than March 31, 1989." While ostensibly arguing the plain language of the statute applies, Petitioners gloss over *this* plain language.

EPA satisfied the requirements of 33 U.S.C. § 1311(b)(2)(C), (D), (F) long ago. For the Steam Electric Power Generating Point Source Category, for example, EPA promulgated BAT limits in 1974. *See* 39 Fed. Reg. 36,186 (Oct. 8, 1974). EPA also issued a major revision and established new BAT limits in 1982. 47 Fed. Reg. 52,290 (Nov. 19, 1982).

Having achieved the initial goal of establishing BAT limits for all point source categories, the CWA now affords EPA the latitude to promulgate revised BAT limits based on ever-advancing technologies, making "reasonable further progress towards the national goal of eliminating the discharge of all pollutants." 33 U.S.C. §

1311(b)(2)(A) (cross-referencing § 1311(b)(2)(C), (D), (F)). The CWA does not tie EPA's hands, forcing it to base these new limits only on technologies that are "available" within three years of promulgation. As in the 2015 ELG Rule, EPA can decide to implement new, more stringent BAT limits in phases, based on its determination of when complex and costly technologies may realistically be available to industry. EPA can also revise those determinations, without violating any arbitrary three-year deadline. In short, Petitioners cannot rely on obsolete statutory provisions to invalidate the Postponement Rule, a post-1989 revision to a post-1989 ELG.

CONCLUSION

EPA acted well within its authority to issue the Postponement Rule. For the foregoing reasons and those explained by EPA in its brief, the Petition for Review of the Postponement Rule should be denied.

Date: October 17, 2018

Respectfully submitted,

/s/ Harry M. Johnson, III
Kristy A.N. Bulleit
Hunton Andrews Kurth LLP
2200 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-1709
202-955-1547 (tel.)
kbulleit@huntonAK.com

Harry M. Johnson, III
Timothy L. McHugh
Hunton Andrews Kurth LLP
Riverfront Plaza, East Tower
951 East Byrd Street

Richmond, VA 23219-4074
804-788-8784 (tel.)
804-788-8239 (tel.)
pjohnson@huntonAK.com
tmchugh@huntonAK.com

Counsel for Utility Water Act Group

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMIT, TYPEFACE REQUIREMENTS, AND TYPE-STYLE REQUIREMENTS

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Date: October 17, 2018

<u>/s/ Harry M. Johnson, III</u>
Harry M. Johnson, III
Counsel for Utility Water Act Group

CERTIFICATE OF SERVICE

I certify that on October 17, 2018, a true and correct copy of the foregoing was filed through the Court's ECF system, and thereby served on all counsel of record in the consolidated cases.

Date: October 17, 2018

<u>/s/ Harry M. Johnson, III</u>
Harry M. Johnson, III
Counsel for Utility Water Act Group

No. 18-60079

IN THE UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

CLEAN WATER ACTION; ENVIRONMENTAL INTEGRITY PROJECT; SIERRA CLUB; WATERKEEPER ALLIANCE, INCORPORATED; PENNENVIRONMENT, INCORPORATED; CHESAPEAKE CLIMATE ACTION NETWORK; PHYSICIANS FOR SOCIAL RESPONSIBILITY, CHESAPEAKE, INCORPORATED; PRAIRIE RIVERS NETWORK,

Petitioners,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY; ANDREW WHEELER, Acting Administrator, United States Environmental Protection Agency,

Respondents.

Petition for Review of Final Administrative Actions of the
United States Environmental Protection Agency

OPENING BRIEF OF PETITIONERS
CLEAN WATER ACTION, ENVIRONMENTAL INTEGRITY PROJECT, SIERRA CLUB, WATERKEEPER ALLIANCE, INC., PENNENVIRONMENT, INC., CHESAPEAKE CLIMATE ACTION NETWORK, PHYSICIANS FOR SOCIAL RESPONSIBILITY, CHESAPEAKE, INC., AND PRAIRIE RIVERS NETWORK

Dated: July 12, 2018 *Counsel listed on following page*

Thomas J. Cmar
Earthjustice
1101 Lake St., Ste. 405B
Oak Park, IL 60301
(312) 257-9338
tcmar@earthjustice.org

Matthew Gerhart
3639 N. Clayton St.
Denver, CO 80205
(510) 847-7721
megerhart@gmail.com

Counsel for Petitioners Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.

Gabriel Clark-Leach
Environmental Integrity Project
1206 San Antonio Street
Austin, Texas 78701
(512) 637-9478
gclark-leach@environmentalintegrity.org

Counsel for Petitioners Environmental Integrity Project, PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network

Casey Roberts
Sierra Club
1536 Wynkoop St., Suite 312
Denver, CO 80202
(303) 454-3355
casey.roberts@sierraclub.org

Joshua D. Smith
Sierra Club
2101 Webster St., Suite 1300
Oakland, CA 94612
(415) 977-5560
(510) 208-3140 (fax)
joshua.smith@sierraclub.org

Counsel for Petitioner Sierra Club

CERTIFICATE OF INTERESTED PERSONS

The undersigned counsel of record certifies that the following listed persons and entities as described in the fourth sentence of Rule 28.2.1 have an interest in the outcome of this case. These representations are made in order that the judges of this court may evaluate possible disqualification or recusal.

1. Petitioners: Clean Water Action, Environmental Integrity Project, Sierra Club, Waterkeeper Alliance, Inc., PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network

2. Intervenor-Respondents: Utility Water Act Group

3. Respondents: United States Environmental Protection Agency; Andrew Wheeler, Acting Administrator, United States Environmental Protection Agency

4. Counsel for Utility Water Act Group: Kristy A. N. Bulleit, Harry Margerum Johnson, III, and Timothy Louis McHugh, Hunton & Williams LLP

5. Counsel for United States Environmental Protection Agency and Andrew Wheeler: Martin F. McDermott and Tsuki Hoshijima, United States Department of Justice, and Avi S. Garbow, United States Environmental Protection Agency

6. Counsel for Sierra Club Only: Casey Roberts and Joshua D. Smith, Sierra Club

7. Counsel for Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.: Thomas J. Cmar, Earthjustice, and Matthew Gerhart

8. Counsel for Environmental Integrity Project, PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network: Gabriel Paul Clark-Leach, Environmental Integrity Project

9. Clean Water Action, Sierra Club, Waterkeeper Alliance, Inc., PennEnvironment, Inc., Chesapeake Climate Action Network, and Prairie Rivers Network are each non-profit organizations that maintain an open membership invitation to organizations, businesses, individuals, and the public in general. Accordingly, their memberships consist of many individual members.

Neither Clean Water Action, Environmental Integrity Project, Sierra Club, Waterkeeper Alliance, Inc., PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., nor Prairie Rivers Network has parent companies, and no publicly-held company owns a 10% or greater interest in any of the aforementioned non-profit organizations.

Dated: July 12, 2018

/s/ Thomas J. Cmar
Thomas J. Cmar

Counsel for Petitioners Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.

STATEMENT REGARDING ORAL ARGUMENT

Pursuant to Local Rule 28.2.3, Petitioners request that the Court schedule oral argument in this case. Petitioners respectfully submit that oral argument would assist the Court's consideration of this case, given the complex procedural history of the rule at issue and the importance of the issues at stake.

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JURISDICTIONAL STATEMENT

This case challenges a rule issued by the United States Environmental Protection Agency ("EPA") in 2017 to postpone certain compliance deadlines in a rule that EPA had issued in 2015 under the Clean Water Act to set national standards for wastewater treatment from steam electric power plants. Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 82 Fed. Reg. 43,494 (Sept. 18, 2017) (the "Delay Rule"). The 2015 rule, known as the Effluent Limitations Guidelines Rule ("ELG Rule"), was the first update in more than thirty years to Clean Water Act limits on the amount of toxic water pollution that certain power plants may discharge. *See* 80 Fed. Reg. 67,838 (Nov. 3, 2015).

Respondent EPA has contended that jurisdiction is proper in this Court pursuant to the Clean Water Act, 33 U.S.C. § 1369(b)(1), on the ground that the Delay Rule revised the ELG Rule's effluent limitations. *See* 82 Fed. Reg. at 43,495 (asserting that section 509(b)(1) of the Clean Water Act, *i.e.*, 33 U.S.C. § 1369(b)(1), applies to the Delay Rule); *id.*at 43,496 (asserting that Delay Rule is issued under EPA's Clean Water Act authority "to revise effluent limitations and standards"). Petitioners disagree, as the Delay Rule – which does not "approve or promulgate" new effluent limitations, but rather postpones compliance with them –

does not fall within any of the enumerated actions that the Clean Water Act specifies must be challenged directly in a court of appeals under Section 1369(b)(1). *See, e.g.*, *Nat'l Ass'n of Mfrs. v. Dep't of Def.*, 138 S. Ct. 617, 624 (2018) (holding that challenges to a different EPA Clean Water Act rule that does not fit within the categories of actions expressly enumerated in Section 1369(b)(1) "must be filed in federal district courts"). Petitioners maintain that the federal question statute, 28 U.S.C. § 1331, confers jurisdiction on the district courts to hear their claims that the Delay Rule violated the Administrative Procedure Act ("APA"), 5 U.S.C. §§ 551-59, 701-06. *See Nat'l Ass'n of Mfrs.*, 138 S. Ct. at 624.

In light of Petitioners' views on jurisdiction, Petitioners challenged the Delay Rule in the United States District Court for the District of Columbia by filing a motion for leave to amend and supplement their complaint challenging EPA's prior administrative stay of the ELG Rule. *See* Pls.' Motion for Leave to Amend & Supplement Complaint, *Clean Water Action v. Pruitt*, No. 17-cv-00817, ECF Doc. 63 (D.D.C. Oct. 5, 2017). Petitioners subsequently filed a protective petition for review in the D.C. Circuit Court of Appeals. Petition, *Clean Water Action v. Pruitt*, No. 17-1216, ECF Doc. 1698542 (D.C. Cir. Oct. 11, 2017). In their petition, Petitioners explained that "because EPA contends that jurisdiction and venue are proper only in Circuit Court, pursuant to 33 U.S.C. § 1369(b)(1), Environmental Petitioners are filing this petition for review as a protective matter

to preserve their right to judicial review" in the event the district court concluded it lacked jurisdiction. *Id.* at 2.

The D.C. Circuit Court of Appeals transferred this protective petition to this Court. Order, *Clean Water Action v. Pruitt*, No. 17-1216, ECF Doc. 1716068 (D.C. Cir. Feb. 1, 2018). The D.C. Circuit did not reach the question of jurisdiction, stating that "[t]ransfer is granted without prejudice to the authority of the Fifth Circuit to determine its own jurisdiction." *Id.* at 1. Following the transfer of the protective petition to this Court, Petitioners moved the Court to hold this case in abeyance pending the decision of the district court. The Court granted the motion on April 5. Order, *Clean Water Action v. Pruitt*, No. 18-60079, ECF Doc. 00514417108 (5th Cir. Apr. 5, 2018). The district court then ruled that it lacked jurisdiction over challenges to the Delay Rule. Opinion at 15, *Clean Water Action v. Pruitt*, No. 17-cv-00817, ECF Doc. 87 (D.D.C. Apr. 18, 2018).[1] Following the district court's decision, this Court lifted the abeyance in this proceeding and set a briefing schedule on May 8, 2018.

[1] Petitioners' appeal of the district court's conclusion that it lacks jurisdiction is pending before the D.C. Circuit Court of Appeals. Notice of Appeal, *Clean Water Action v. Pruitt*, No. 18-5149 (D.C. Cir. filed May 11, 2018). Petitioners moved the D.C. Circuit to hold in abeyance the Delay Rule issue in that appeal, pending this Court's decision in this case. The D.C. Circuit has not yet ruled on the motion.

STATEMENT OF ISSUES

Whether, in postponing certain compliance deadlines in the Effluent Limitation Guidelines Rule for power plants, the United States Environmental Protection Agency issued an *ultra vires* action that exceeds the Agency's statutory authority and is arbitrary, capricious, and not in accordance with law, in light of:

1. The absence of inherent authority for a federal agency to postpone compliance deadlines in a rule pending reconsideration, where no statutory provision authorizes such a delay;

2. The Agency's failure to address all of the relevant factors under 33 U.S.C. § 1314(b)(2)(B) that would be necessary for the Agency to lawfully revise any of the Rule's effluent limitations and standards; and

3. The Agency's delay of compliance deadlines in violation of the maximum three-year compliance deadline in the Clean Water Act, 33 U.S.C. § 1311(b)(2)(C), (D), (F).

STATEMENT OF THE CASE

This case concerns EPA's unjustified and illegal postponement of compliance deadlines for standards critical to protect people and the environment from toxic water pollution as required by the Clean Water Act ("CWA"). In 2015, EPA promulgated long-overdue revisions to the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category

(“ELG Rule” or “ELGs”), which if fully implemented would reduce toxic and conventional water pollution from steam electric power plants by over 1.4 billion pounds per year. 80 Fed. Reg. at 67,841. Nearly two years after the ELGs became effective, EPA finalized the action challenged in this case, which delayed implementation of two critical provisions of the ELG Rule by two years while it reconsiders those provisions. *See* 82 Fed. Reg. at 43,496. EPA also indicated in the Delay Rule that it “anticipates that [its] next rulemaking will necessarily address compliance dates in some fashion.” *Id.* at 43,498. As a result, the Delay Rule has created uncertainty around the implementation of the ELGs that has caused many state agencies that issue permits to power plants to delay compliance deadlines for these provisions even further.

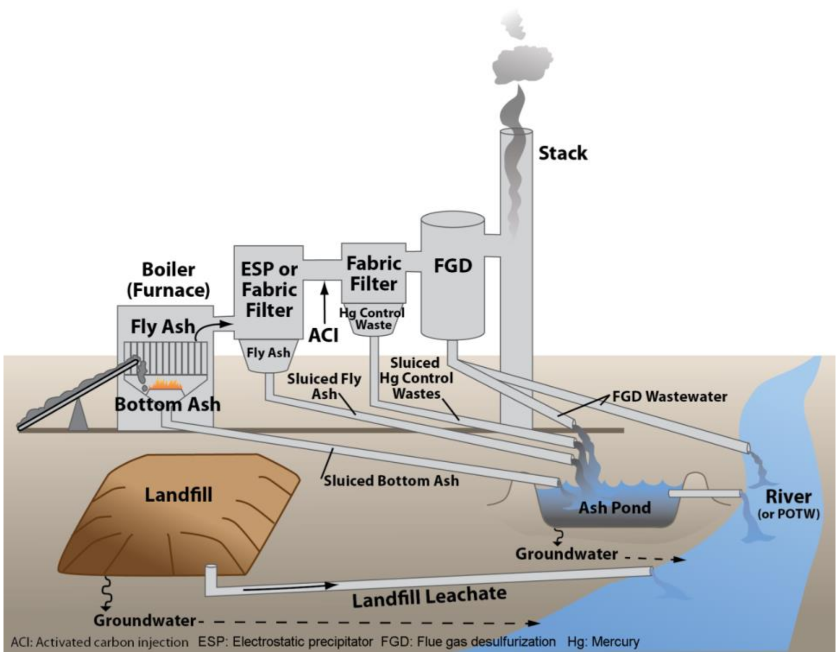
I. WATER POLLUTION FROM POWER PLANTS

Steam electric power plants are by far the largest industrial source of toxic water pollution in the country. EPA, Environmental Assessment for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (“EA”), Index.12553, at 3-15, Table 3-3 (Sept. 2015). This source category generates more toxic wastewater than the next two-largest polluting industries combined. *Id.* According to EPA, “pollutants in steam electric power plant wastewater discharges present a serious public health concern and

cause severe ecological damage, as demonstrated by numerous documented impacts, scientific modeling, and other studies." 80 Fed. Reg. at 67,840.[2]

A. Types of Wastewater Discharged by Power Plants

The ELG Rule is designed to reduce toxic wastewater from power plants through limits on at least six different wastewater streams. *See id.* at 67,841. The following figure, produced by EPA, illustrates the types of wastewater typically produced by power plants.[3]



[2] A more detailed discussion of water pollution from power plants, its impact on human health and the environment, and available treatment technologies can be found in the Opening Brief of Petitioners Environmental Integrity Project, Sierra Club, and Waterkeeper Alliance, Inc. at 4-17, *Sw. Elec. Power Co. v. EPA*, No. 15-60821, ECF Doc. 513785014 (5th Cir. Dec. 5, 2016).

[3] EPA, Steam Electric Power Generating Effluent Guidelines, 2015 Final Rule, Key Wastestreams, *available at* https://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule (last updated Apr. 9, 2018).

At issue in this case are the ELG Rule's effluent limitations for bottom ash transport water and flue gas desulfurization wastewater. Bottom ash comprises particles that remain after a fuel, such as coal or oil, is burned. EPA, Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category ("TDD"), Index.12840, at 4-6 (Sept. 2015). Bottom ash accumulates in the bottom of the boiler before being flushed away using either wet or dry systems. *Id.* at 4-24. Nearly 300 plants dispose of bottom ash by using water to transport the ash to an impoundment, which then discharges water mixed with bottom ash into a river, lake, or stream. *See* 80 Fed. Reg. at 67,846; TDD, Index.12840, at 6-10, Table 6-6.

Plants that have installed air pollution controls commonly known as scrubbers (more technically known as "flue gas desulfurization" or "FGD" systems) also discharge wastewater containing metals and other pollutants that the scrubber system has removed from the air emissions. *See* 80 Fed. Reg. at 67,846. As with bottom ash transport water, many power plants send FGD wastewater to impoundments, which then discharge water mixed with FGD waste into rivers, lakes, and streams. *See* TDD, Index.12840, at 7-3 to 7-4.

B. Pollutants Contained in Power Plant Wastewater

Wastewater from power plants, particularly FGD wastewater and bottom ash transport water, contains an array of pollutants. *See, e.g.*, *id.* at 6-6 to 6-14, 6-19,

6-21, 6-23 to 6-26. These pollutants include toxic metals such as mercury, arsenic, lead, and selenium that can cause severe health and environmental problems in the form of cancer risks in humans, lowered IQ among children, and deformities and reproductive harm in fish and wildlife. 80 Fed. Reg. at 67,838-40. Power plant wastewater also includes nutrients that contribute to algal blooms, and salts such as bromides and chlorides that can cause violations of safe drinking water standards. *See* EA, Index.12553, at 3-2 to 3-12.

Water pollution from power plants makes over 4,000 miles of rivers unsafe for use as a source of drinking water or for fish, and makes over 6,000 miles of rivers unsafe for children to use for recreational fishing. *See id.* at 7-35. EPA estimates that roughly 30 million people are exposed to fish contaminated by coal ash pollutants, including over 3 million young children exposed to lead and over 400,000 children exposed to mercury *in utero*. Benefit and Cost Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category ("BCA"), Index.12843, at 3-4, 3-9, 3-16 (Sept. 2015).

According to EPA, approximately 62 percent of lakes, ponds, and reservoirs, and 43 percent of rivers and streams receiving coal plant waste may have reduced water quality as a direct result of that pollution. EA, Index.12553, at 6-1. Nearly half of those waterways have water quality worse than EPA's National

Recommended Water Quality Criteria, and nearly a fifth of them violate standards for drinking water. *Id.* at 6-2, Table 6-1. Over a quarter of the waters receiving power plant discharges have been formally listed under the CWA as having water quality impaired by a pollutant found in coal combustion wastewater, with mercury being the most common cause of impairment. *Id.* at 3-38, 3-42.

Power plant discharges frequently cause fish to be unsafe for people to eat and degrade drinking water sources. Nearly half of the immediate receiving waters (42 percent) are already under fish consumption advisories for mercury or lead—pollutants present in power plant wastewater. *Id.* at 3-44. A third of power plants are located within 5 miles of a drinking water intake or reservoir. *Id.* at 3-47. Virtually all waters receiving power plant discharges (90%) have a drinking water resource within 5 miles of the discharge location. *Id.* at 3-38. Although public drinking water system operators are responsible for treating source water to remove some of these pollutants, doing so increases the costs of treatment. *Id.* at 3-46.

In addition to damaging human health, these pollutants harm fish and wildlife. Selenium is acutely poisonous to fish and other aquatic life even in small doses; concentrations below eight parts per billion can kill fish, and lower concentrations can leave fish deformed or sterile. Steam Electric Power Generation Point Source Category: Final Detailed Study Report, Index.47, at 6-4

(Oct. 2009); EA, Index.12553, at 3-4 to 3-5. Selenium also bioaccumulates and interferes with fish reproduction, meaning that it can permanently destroy wildlife populations in lakes and rivers as it works its way through the ecosystem over a period of years. EA, Index.12553, at 3-4 to 3-5.

In the 2015 ELG Rule, EPA found that impoundments, which power plants frequently use to store and dispose of bottom ash and FGD wastewater before discharging it to waterways, are ineffective at removing pollutants that are dissolved in wastewater. 80 Fed. Reg. at 67,840. Settling can remove some pollutants found in particulate form (*i.e.*, suspended solids), but it is ineffective at removing pollutants that are dissolved in the wastewater. *Id.* at 67,851. Certain pollutants, such as selenium, boron, and magnesium, are more likely present in wastewater in dissolved form, especially under the acidic conditions found in many impoundments. *Id.* Impoundments are not only ineffective at removing dissolved pollutants, but are also vulnerable to structural failure and leaks, which have led to numerous cases of drinking water contamination. *Id.* at 67,840, 67,876, 67,879.

II. CLEAN WATER ACT

To achieve the national goal of eliminating water pollution, the Clean Water Act requires facilities to meet a series of increasingly stringent technology-based effluent limitations, which are the centerpiece of the Act. *Tex. Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 927 (5th Cir. 1998). These effluent limitations must be based

on ELGs promulgated by EPA, which are national, minimum wastewater treatment standards for categories of sources. *E.I. DuPont de Nemours & Co. v. Train*, 430 U.S. 112, 127, 129 (1977). ELGs set a federal floor for environmental protection, based on application of wastewater treatment technology, in order to avoid a "race to the bottom" by state regulators. *See Nat. Res. Def. Council, Inc. v. Train*, 510 F.2d 692, 709-10 (D.C. Cir. 1974). The Clean Water Act requires EPA to reevaluate its effluent limitations every five years, 33 U.S.C. § 1311(d), and the ELGs every year, *id.* § 1314(b), and requires compliance with the ELGs no later than three years after the limitations are promulgated, *id.* § 1311(b)(2)(C), (D), (F).

ELGs are not directly enforceable, but become enforceable at a particular facility only when incorporated into a National Pollutant Discharge Elimination System ("NPDES") permit. *See Tex. Oil & Gas Ass'n*, 161 F.3d at 928 ("NPDES permits are the CWA's implementation mechanism; they are the instrument by which ELGs are made binding on individual dischargers."). NPDES permits are required to be renewed every five years, 33 U.S.C. § 1342(b)(1)(B). State environmental agencies issue most NPDES permits, while EPA's regional offices issue them in a handful of states.[4]

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[4] State and tribal entities authorized to issue NPDES permits are listed on the Authority tab of EPA's NPDES State Program Information website, https://www.epa.gov/npdes/npdes-state-program-information (last updated June 28, 2018).

III. EFFLUENT LIMITATION GUIDELINES FOR STEAM ELECTRIC POWER PLANTS

A. 2015 ELG Rule

EPA's 2015 ELG Rule was the first update to the ELGs for water pollution from power plants since 1982, and the first time EPA had ever established ELGs for toxic pollutants in that wastewater based on the stringent best available technology economically achievable ("BAT") standard. 80 Fed. Reg. at 67,840. In the absence of nationwide BAT limits on toxic pollutants in power plant wastewater, it was left up to state and regional permitting agencies to set limits on a case-by-case basis. 33 U.S.C. § 1342(a)(1)(B); TDD, Index.12840, at 8-12 (describing burden on states and regulated industry of case-by-case process). Permitting agencies largely failed to do so and, consequently, most power plants have for decades been able to dump their wastewater into rivers, lakes, and streams without any specific limits on toxic pollutants. Comments of Environmental Integrity Project, et al., Index.9069, Ex. 1, at 7.

The ELG Rule was in many respects a significant step forward in protecting people and the environment from toxic water pollution as required by the Clean Water Act.[5] EPA has admitted that the standards in place prior to the 2015 ELG

[5] Several of Petitioners challenged certain portions of the 2015 rule as inconsistent with the Clean Water Act. *See* Opening Br. of Pets. Environmental Integrity Project, Sierra Club, and Waterkeeper Alliance, Inc., *Sw. Elec. Power Co. v. EPA*, No. 15-60821, ECF Doc. 513785014 (5th Cir. Dec. 5, 2016). The portions of the

Rule were out of date because they did not "adequately control the pollutants (toxic metals and other) discharged by this industry, nor do they reflect relevant process and technology advances that have occurred in the last 30-plus years." 80 Fed. Reg. at 67,840-41.

Among other things, the ELG Rule established new, more protective limitations and standards for bottom ash transport water and FGD wastewater, which are the two largest toxic wastestreams generated by power plants.[6] The rule set limits on discharges of mercury, arsenic, selenium, and other pollutants in FGD wastewater discharges, based on the levels that biological treatment and chemical precipitation technology had achieved at existing plants. *See* 40 C.F.R. §§ 423.13(g)(1)(i), 423.16(e). EPA concluded that biological and chemical treatment have been used and tested at power plants for more than ten years and that these treatment methods are "more effective than surface impoundments" at removing pollutants from FGD wastewater. 80 Fed. Reg. at 67,851.

2015 rule challenged in that action were not affected by the Delay Rule at issue in this case.

[6] EPA estimates that FGD wastewater and bottom ash transport water make up 91% of annual baseline discharges in pounds, and 89% of annual discharges expressed as toxicity-weighted pound equivalents. EPA, Final Sanitized Incremental Costs and Pollutant Removals for the Final Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, Index.12134, at 11-40, 12-29, 15-4 (Sept. 2015).

EPA also concluded that cost-effective technologies are in use today that can eliminate a power plant's need to discharge any bottom ash transport water, *id.* at 67,852-53, and therefore determined that the Clean Water Act requires existing power plants to meet a zero-discharge standard for bottom ash transport water. 40 C.F.R. §§ 423.13(h)(1)(i), 423.16(f)-(g).

The ELG Rule became effective on January 4, 2016. 80 Fed. Reg. at 67,838. Thereafter, when any NPDES permit is issued, it must include a date for complying with the ELGs. *Id.* at 67,882-83. Under the 2015 rule, that date was to be as soon as possible beginning November 1, 2018 but no later than December 31, 2023. *Id.* at 67,854, 67,882-83. The NPDES permitting authority is to determine the "as soon as possible" date based on factors such as the time for power plants to "expeditiously plan . . . , design, procure, and install equipment to comply." *Id.* at 67,883; 40 C.F.R. § 423.11(t).

B. EPA's Indefinite Stay of the ELG Rule

On April 25, 2017, after the ELG Rule had been in effect for more than 16 months, EPA published a notice staying indefinitely "the compliance deadlines for the new, more stringent limitations and standards" in the ELG Rule. EPA, Postponement of Certain Compliance Dates for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 82 Fed. Reg. 19,005 (Apr. 25, 2017) (the "Indefinite Stay"). EPA cited to the

Administrative Procedure Act ("APA"), 5 U.S.C. § 705, as authority for the Indefinite Stay, which was promulgated without prior notice and an opportunity for public comment. 82 Fed. Reg. 19,005. EPA justified the Indefinite Stay as a means to "preserve the regulatory status quo . . . while the litigation is pending and the reconsideration is underway." *Id.*

Petitioners in this case challenged the Indefinite Stay in federal district court, alleging that EPA lacked authority to stay the ELGs under the APA, had failed to justify the stay under the four-factor preliminary injunction test applicable to such stays, and had violated APA requirements for notice and comment. *See* Complaint, *Clean Water Action v. Pruitt*, No. 17-cv-00817, ECF Doc. 1 (D.D.C. May 3, 2017). Just one day after briefing concluded on cross-motions for summary judgment regarding the Indefinite Stay, *see* EPA's Reply in Support of its Cross-Motion for Dismissal or Summary Judgment, *Clean Water Action v. Pruitt*, No. 17-cv-00817, ECF Doc. 58 (D.D.C. Sept. 11, 2017), the EPA Administrator signed the Delay Rule, which postpones compliance with the ELGs and purports to withdraw the Indefinite Stay. 82 Fed. Reg. at 43,496, 43,499.

C. EPA's Delay of the ELGs

On June 6, 2017, EPA proposed to postpone the ELG compliance deadlines, asserting as a justification the Administrator's decision to reconsider the 2015 Rule. 82 Fed. Reg. 26,017. Along with many others, several of Petitioners filed

extensive comments opposing the proposed postponement of the ELG Rule. *See* Comments of Sierra Club et al., Index.12878.

At the time EPA issued the Delay Rule in September 2017, the 2015 ELG Rule had been in effect for over 20 months and numerous power plants had already begun implementation. *See* 82 Fed. Reg. at 43,497. In the Delay Rule, EPA stated that because it was reconsidering the BAT limitations for FGD wastewater and bottom ash transport water, it was necessary to postpone the compliance deadlines for those standards so as to "prevent unnecessary expenditure of resources until EPA finalizes any rulemaking as a result of its reconsideration of the 2015 Rule." *Id.* at 43,495. The Delay Rule extended the "as soon as possible" date for these two effluent limitations by two years, from November 1, 2018 until November 1, 2020. *Id.* at 43,496.[7] November 1, 2020 is nearly five years after the bottom ash and FGD limitations were promulgated on November 3, 2015. 80 Fed. Reg. at 67,838.

EPA asserted that its authority to postpone the Delay Rule derived from two sources: the agency's "inherent authority" to reconsider a rule; and the agency's Clean Water Act authority to issue and revise effluent limitations. 82 Fed. Reg. at 43,496. With respect to the enumerated factors that the Clean Water Act requires

[7] The Delay Rule did not modify the "no later than" date of December 31, 2023, as EPA was not aware of evidence that this date was immediately driving compliance expenditures. 82 Fed. Reg. at 43,496.

EPA to evaluate when revising effluent limitations, *see* 33 U.S.C. § 1314(b)(2)(B), EPA referred only to the provision that the Administrator can consider "other factors as the Administrator deems appropriate." 82 Fed. Reg. at 43,498. EPA did not reevaluate any of the factors that the Clean Water Act requires to be considered when issuing or revising effluent limitations, but instead asserted that it would evaluate the remaining factors as it reconsidered the rule. *See id.* at 43,497 (stating that in "the next rulemaking," EPA would consider issues raised by petitions for reconsideration of the ELG Rule, "in conjunction with the statutory factors for determining BAT for these wastestreams").

In the Delay Rule, "EPA acknowledge[d] that postponement of the compliance dates could lead to a delay in the accrual of some of the benefits attributable to the 2015 Rule." *Id.* EPA reported that "foregone annualized benefits for a two-year delay would be between $26.6 million and $33.5 million," and admitted that "due to data and analysis limitations, the forgone monetized benefits are likely underestimated." *Id.* at 43,498.

By postponing the ELG Rule's standards for the two largest toxic wastestreams generated by power plants, EPA is allowing power plants to continue polluting the nation's waterways with toxic materials despite EPA's 2015 rule that cost-effective technologies to prevent such pollution are easily available.

SUMMARY OF ARGUMENT

EPA had no legal authority to issue the Delay Rule. The sole purpose of the Delay Rule was to postpone compliance with the ELG Rule while the agency reconsiders its first-ever limits on the largest industrial source of toxic water pollution in the United States. EPA has no inherent authority to stay the ELG Rule pending reconsideration. To the contrary, as a federal agency, EPA has only as much authority as Congress granted it, and therefore EPA must point to some statutory basis for the Delay Rule. Here, neither the Clean Water Act, the Administrative Procedure Act, nor any other statute authorizes EPA to postpone effluent limitations solely because the agency intends to reconsider such limits.

Despite citing the Clean Water Act provisions for issuing or revising effluent limitations as the authority for the Delay Rule, EPA failed to consider all of the factors that the statute requires to be considered when promulgating effluent limits. This was not an oversight, but a deliberate decision, based on the agency's claim that it intends to consider all of the relevant factors in a future reconsideration proceeding. But EPA has no legal authority to ignore statutory provisions now simply because the agency promises to follow the statute in the future.

Furthermore, the Delay Rule extends compliance deadlines in violation of the Clean Water Act requirement that compliance be achieved no later than three years after issuance of effluent limitations. EPA finalized the ELG Rule's effluent

limits in 2015, yet the Delay Rule postponed the compliance deadlines to 2020, at the earliest. Even if the Delay Rule is considered to have reissued the effluent limits, the earliest compliance deadline of November 1, 2020 is more than three years after the Delay Rule was issued on September 18, 2017, and the latest compliance deadline in 2023 is far more than three years after the Delay Rule was issued.

For these reasons, the Delay Rule exceeded EPA's statutory authority and must be vacated.

ARGUMENT

I. STANDARD OF REVIEW

Under the Administrative Procedure Act, agency action taken "in excess of statutory [] authority," must be "set aside." 5 U.S.C. § 706(2)(C). "It is axiomatic that an administrative agency's power to promulgate legislative regulations is limited to the authority delegated by Congress." *Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 208 (1988). Agency action is *ultra vires* if the agency cannot identify a statutory provision authorizing the action. *See City of Arlington, Tex. v. FCC*, 569 U.S. 290, 297 (2013). An EPA action that "exceeds the EPA's statutory authority . . . is *ultra vires* and cannot be upheld." *Nat'l Pork Producers Council v. EPA*, 635 F.3d 738, 751 (5th Cir. 2011).

The APA also requires courts to set aside an agency rule if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). An agency rule is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). The Court must determine whether the rule "bears a rational relationship to the statutory purposes" and whether "there is substantial evidence in the record to support it." *Mercy Hosp. of Laredo v. Heckler*, 777 F.2d 1028, 1031 (5th Cir. 1985). This Court "'may not supply a reasoned basis for the agency's action that the agency itself has not given.'" *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 (quoting *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947)).

When interpreting a statute, a court "must give effect to the unambiguously expressed intent of Congress," such that "[i]f the intent of Congress is clear, that is the end of the matter." *Chevron, U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837, 842–43 (1984). Moreover, a statutory provision should be read in concert with the "surrounding provisions, as well as the broader context of the statute as a whole." *Khalid v. Holder*, 655 F.3d 363, 367 (5th Cir. 2011),

abrogated on other grounds by Scialabba v. Cuellar de Osorio, 134 S. Ct. 2191 (2014). If a statutory provision is ambiguous, the court should defer to an agency's interpretation only if it represents a "permissible construction of the statute." *Chevron*, 467 U.S. at 843.

II. PETITIONERS HAVE STANDING TO CHALLENGE THE DELAY RULE.

When EPA finalized the ELG Rule in 2015, it recognized that existing standards for coal-burning power plants did not "adequately control the pollutants (toxic metals and other) discharged by [the] industry" and that these pollutants "can cause severe health and environmental problems in the form of cancer and non-cancer risks in humans, lowered IQ among children, and deformities and reproductive harm in fish and wildlife." 80 Fed. Reg. at 67,838, 67,840. By delaying compliance with the ELG Rule's more protective standards that would significantly reduce this pollution by two or more years, EPA's action will perpetuate the harm to Petitioners' members, who use and enjoy waters that are affected by power plant pollution for their livelihood, drinking water, fishing, recreation, and aesthetic purposes. Petitioners have standing to challenge EPA's Delay Rule on behalf of these members.

"[T]o satisfy Article III's standing requirements, a plaintiff must show (1) it has suffered an 'injury in fact' that is (a) concrete and particularized and (b) actual or imminent, not conjectural or hypothetical; (2) the injury is fairly traceable to the

challenged action of the defendant; and (3) it is likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision." *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs., Inc.*, 528 U.S 167, 180-81 (2000) (citing *Lujan v. Defs. of Wildlife*, 504 U.S. 555, 560-61 (1992)). An organization has "standing to bring a suit on behalf of its members when: (1) its members would otherwise have standing to sue in their own right; (2) the interests it seeks to protect are germane to the organization's purpose; and (3) neither the claim asserted nor the relief requested requires the participation of individual members." *Texans United for a Safe Econ. Educ. Fund v. Crown Cent. Petroleum Corp.*, 207 F.3d 789, 792 (5th Cir. 2000) (citing *Hunt v. Wash. State Apple Advert. Comm'n*, 432 U.S. 333, 343 (1977)). "[T]he presence of one party with standing is sufficient to satisfy Article III's case or controversy requirement." *Texas v. United States*, 809 F.3d 134, 151 (5th Cir. 2015) (citing *Rumsfeld v. Forum for Acad. Institutional Rights, Inc.*, 547 U.S. 47, 52 n.2 (2006)).

Members of the Petitioners' organizations would have standing to sue in their own right. As the declarations submitted with this brief demonstrate,[8] individual members suffer concrete injuries as a result of the Delay Rule's postponement of reductions in harmful pollution of waters that these individuals

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[8] Along with this brief, Environmental Petitioners are filing a motion for leave to file declarations for the purpose of demonstrating Article III standing.

use and enjoy. *See* Declaration of Don Davis ¶¶ 5-7 (July 3, 2018) ("Davis Decl"); Declaration of Howard Dent ¶¶ 5-9 (July 8, 2018) ("Dent Decl."); Declaration of John Hickey ¶¶ 8-11 (July 9, 2018) ("Hickey Decl."); Declaration of Laura Jacko ¶¶ 5-9 (July 12, 2018) ("Jacko Decl."); Declaration of Dr. Paul Keck ¶¶ 4-8 (July 11, 2018) ("Keck Decl."); Declaration of Kurt Limbach ¶¶ 6-9 (July 5, 2018) ("Limbach Decl."); Declaration of Brendan McManus ¶¶ 6-8 (July 9, 2018) ("McManus Decl."); Declaration of Ted Popovich ¶¶ 5-9 (July 10, 2018) ("Popovich Decl."); Declaration of Paul Rolke ¶¶ 5-9 (July 10, 2018) ("Rolke Decl."); Declaration of Tim Smith ¶¶ 6-9 (July 9, 2018) ("Smith Decl."). Many state agencies have issued draft or final NPDES permits to power plants that cite to the Delay Rule and the uncertainty that it has created concerning implementation of the ELG Rule as justification for delaying compliance with bottom ash and FGD wastewater effluent limitations until the end of 2023. Declaration of Dalal Aboulhosn ¶¶ 5-7 (July 12, 2018) ("Aboulhosn Decl."); Declaration of Patrick Grenter ¶¶ 8-9 (July 10, 2018) ("Grenter Decl."); Declaration of Lynn Thorp ¶¶ 4-8 (July 6, 2018) ("Thorp Decl."). If the Delay Rule remains in effect, other power plants are likely to receive NPDES permits in the near future that will contain later compliance dates than the 2015 ELG Rule allows. Aboulhosn Decl. ¶¶ 8-11; Grenter Decl. ¶ 11; Declaration of Carol Hays ¶ 6 (July 5, 2018) ("Hays Decl."); Declaration of Eric Schaeffer ¶¶ 9-11 (June 28, 2018) ("Schaeffer Decl.");

Declaration of Timothy Whitehouse ¶ 10 (July 5, 2018) ("Whitehouse Decl."); Declaration of Marc A. Yaggi ¶¶ 20-21 (July 10, 2018) ("Yaggi Decl."). Petitioners' members who use and enjoy waters downstream from power plants that are affected by the Delay Rule are harmed by the Delay Rule's postponement of compliance with requirements that power plants significantly reduce their discharges of pollution into those waters.

Petitioners' members live near waterbodies that are contaminated with toxic pollutants from bottom ash transport and FGD wastewater from power plants subject to the Delay Rule and obtain their drinking water from these waterbodies or from wells near coal ash impoundments. *See* Dent Decl. ¶ 2; Hickey Decl. ¶¶ 7-8; Jacko Decl. ¶¶ 5-6; Limbach Decl. ¶ 6; Keck Decl. ¶¶ 2, 4, 6; Popovich Decl. ¶ 5; Rolke Decl. ¶ 4. Petitioners' members also regularly observe wildlife and birds near power plants subject to the Delay Rule. Hickey Decl. ¶ 9; Popovich Decl. ¶ 6; Rolke Decl. ¶ 4. Moreover, Petitioners' members enjoy kayaking, rowing, wading, swimming, fishing, and boating in waterways near coal ash impoundments at power plants subject to the Delay Rule that discharge bottom ash transport and FGD wastewater. Davis Decl. ¶ 6; Dent Decl. ¶¶ 6-7; Hickey Decl. ¶ 9; Jacko Decl. ¶ 9; Limbach Decl. ¶ 8-9; Keck Decl. ¶ 4; McManus Decl. ¶¶ 5-6; Rolke Decl. ¶¶ 1, 4; Smith Decl. ¶¶ 6-9. The Delay Rule's postponement of compliance with effluent limitations at power plants whose pollution harms Petitioners'

members' aesthetic, health, property, and recreational interests establishes the requisite injury-in-fact to satisfy Article III standing requirements. *See Laidlaw*, 528 U.S. at 183 ("[P]laintiffs adequately allege injury in fact when they aver that they use the affected area and are persons 'for whom the aesthetic and recreational values of the area will be lessened' by the challenged activity.'" (quoting *Sierra Club v. Morton*, 405 U.S. 727, 735 (1972))).

Many of Petitioners' members have already reduced or altered their use of waterways impacted by toxic pollution from coal-fired power plants due to concerns about the health effects of being exposed to toxic pollutants or consuming fish caught in those waters. Dent Decl. ¶¶ 6-7; Jacko Decl. ¶ 9; Keck Decl. ¶ 8; Limbach Decl. ¶¶ 8-9; McManus Decl. ¶ 6; Smith Decl. ¶ 7. These reasonable fears of harm from power plant water pollution that the Delay Rule has perpetuated also constitute injuries in fact. *See Laidlaw*, 528 U.S. at 184; *see also Sierra Club, Lone Star Chapter v. Cedar Point Oil Co.*, 73 F.3d 546, 556 (5th Cir. 1996) (concern about future adverse effects from a facility's pollution also satisfies the injury-in-fact requirement).

Petitioners' members would benefit from vacatur of the Delay Rule, which would require affected power plants to comply with the 2015 ELG Rule's original requirements to significantly reduce the discharge of toxic pollutants in bottom ash and FGD wastewater "as soon as possible on or after November 1, 2018." 80 Fed.

Reg. at 67,882-83. The Delay Rule postpones the day when Petitioners' members will receive the benefits of the ELG Rule from the reduction of toxic pollution that power plants discharge to waters they use and enjoy. Where plaintiffs would benefit from implementation of a rule, courts have held that they have standing to challenge the rule's delay or repeal. *See, e.g.*, *Int'l Ladies' Garment Workers' Union v. Donovan*, 722 F.2d 795, 799, 809-12 (D.C. Cir. 1983) (holding that labor unions representing factory workers, and other associations, had standing to challenge the repeal of restrictions on home work); *Nat. Res. Def. Council v. Nat'l Highway Traffic Safety Admin.*, No. 17-2780, 2018 WL 3189321, at *14 (2d Cir. June 29, 2018) (explaining that environmental organizations' members who live in areas with air pollution caused in part by delay in implementing an automobile emission rule have standing).

Petitioners' members' injuries are "fairly traceable" to EPA's postponement of the ELG Rule's compliance deadlines, which has caused or will cause NPDES permitting authorities to issue permits allowing pollution prohibited by the ELGs to continue for at least two years longer than was permitted under the original ELG Rule. Aboulhosn Decl. ¶ 11; Dent Decl. ¶ 11; Grenter Decl. ¶¶ 6-11; Hays Decl. ¶¶ 7-8; Declaration of David Masur ¶ 11 (June 3, 2018) ("Masur Decl."); Declaration of Michael Tidwell ¶¶ 8-11 (July 9, 2018) ("Tidwell Decl."); Yaggi Decl. ¶¶ 20-21. Petitioners' members' injuries from these delays would be

redressed by a favorable decision vacating the Delay Rule, which would require NPDES permitting agencies to resume implementing the compliance deadlines in the 2015 ELG Rule. *See, e.g.*, Hickey Decl. ¶¶ 14-15; Jacko Decl. ¶ 11; Keck Decl. ¶ 10; Limbach Decl. ¶ 11; McManus Decl. ¶ 10; Popovich Decl. ¶ 10; Rolke Decl. ¶ 13; *see generally Franklin v. Massachusetts*, 505 U.S. 788, 801-803 (1992) (holding redressability prong satisfied by request for declaratory relief even though any actual change would require discretionary determination by President); *Bennett v. Spear*, 520 U.S. 154, 170-71 (1997) (plaintiffs satisfied the "relatively modest" redressability requirement where a finding that the agency had acted illegally would require the agency to reevaluate its final decision).

Moreover, the issue at stake here—the implementation of a Clean Water Act rule that will eliminate or reduce toxic water pollution from power plants—is central to Petitioners' institutional missions. Aboulhosn Decl. ¶¶ 5-7; Hays Decl. ¶ 2; Schaeffer Decl. ¶¶ 3-4; Thorp Decl. ¶¶ 4-7; Tidwell Decl. ¶¶ 3-4; Whitehouse Decl. ¶ 3; Yaggi Decl. ¶¶ 10-14. Several of the Petitioner organizations secured a consent decree requiring EPA to review and update the ELG Rule, *Defs. of Wildlife v. EPA*, No. 10-cv-01915, ECF Doc. 15 (D.D.C. Mar. 19, 2012), and Petitioners submitted numerous and extensive comments on the proposed ELG Rule, *see, e.g.*, Comments of Environmental Integrity Project *et al.*, Index.6781, as well as the proposed Delay Rule. Comments of Sierra Club *et al.*, Index.12878. Several of

the Petitioner organizations have intervened to defend portions of the 2015 ELG Rule challenged by industry groups. *See* Motion for Leave to Intervene by Sierra Club, Environmental Integrity Project, Waterkeeper Alliance, Inc. and Clean Water Action, *Sw. Elec. Power Co. v. EPA*, No. 15-60821, ECF Doc. 00513316813 (5th Cir. Dec. 21, 2015). All of these actions demonstrate that the issues at stake in this case—whether EPA has legal authority to postpone the pollution reductions required by the ELG Rule—are germane to the organizations' missions.

Finally, neither the claims asserted nor the relief requested requires the participation of individual members of Petitioners. *See Hunt*, 432 U.S. at 343. This lawsuit raises pure questions of law, and the court does not need to consider the circumstances of individual members in order to decide the merits or resolve the claim for relief. *See Int'l Union, United Auto., Aerospace & Agr. Implement Workers of Am. v. Brock*, 477 U.S. 274, 278-88 (1986) (holding that the participation of individual members was not required, where the lawsuit raised "a pure question of law" as to whether the agency properly interpreted a statute, and the relief requested did not require consideration of the "unique facts" of each member).

For these reasons, Petitioners have standing to bring this case.

III. EPA HAD NO LEGAL AUTHORITY TO ISSUE THE DELAY RULE.

The Delay Rule is an *ultra vires* action that has no legal basis. In the Delay Rule, EPA announced that it was "postponing the earliest compliance dates for the new, more stringent, BAT effluent limitations" in the 2015 ELG Rule for two years. 82 Fed. Reg. at 43,494. EPA postponed the compliance dates for this length of time because the agency expects to conclude its reconsideration process before the November 2020 delayed compliance deadline. *See id.* at 43,498. The Delay Rule is thus the functional equivalent of a stay, as it is designed to pause implementation of portions of the ELG Rule while the agency reconsiders the substance of the underlying rule. *See id.* at 43,495-96.

As a federal administrative agency, EPA is a creature of statute, and therefore possesses only as much authority as Congress has granted it. *See Bowen*, 488 U.S. at 208 ("It is axiomatic that an administrative agency's power to promulgate legislative regulations is limited to the authority delegated by Congress."); *North Carolina v. EPA*, 531 F.3d 896, 922 (D.C. Cir.), *reh'g granted in part*, 550 F.3d 1176 (D.C. Cir. 2008) ("Lest EPA forget, it is 'a creature of statute,' and has 'only those authorities conferred upon it by Congress'; 'if there is no statute conferring authority, a federal agency has none.'" (quoting *Michigan v. EPA*, 268 F.3d 1075, 1081 (D.C. Cir. 2001))).

Here, EPA purported to issue the Delay Rule under the agency's "inherent authority" to reconsider a rule. *See* 82 Fed. Reg. at 43,496. But agencies have no inherent authority to stay a rule pending reconsideration. *Nat. Res. Def. Council*, 2018 WL 3189321, at *11 (rejecting an agency's argument "that it possessed 'inherent authority' to indefinitely delay the rule" pending reconsideration); *Clean Air Council v. Pruitt*, 862 F.3d 1, 9 (D.C. Cir. 2017) ("EPA argues that it nonetheless has 'inherent authority' to 'issue a brief stay' of a final rule . . . while it reconsiders it. . . . EPA cites nothing for the proposition that it has such authority."). Instead, EPA must identify a statutory provision that authorizes the agency to stay or postpone effluent limitations. *See Nat. Res. Def. Council*, 2018 WL 3189321, at *11-12; *Clean Air Council*, 862 F.3d at 9.

EPA also cited the Clean Water Act as authorizing the Delay Rule, *see* 82 Fed. Reg. at 43,496, but the Act does not include any provisions authorizing EPA to stay effluent limitations pending reconsideration of such limits. By contrast, other environmental statutes, such as the Clean Air Act, contain such a provision. *See* 42 U.S.C. § 7607(d)(7)(B) ("The effectiveness of the rule may be stayed during such reconsideration, however, by the Administrator or the court for a period not to exceed three months."). The absence of such a provision in the Clean Water Act should be interpreted as Congress deciding not to grant EPA authority to stay effluent limitations pending reconsideration. *See Burlington N. & Santa Fe*

Ry. Co. v. White, 548 U.S. 53, 63 (2006) ("We normally presume that, where words differ as they differ here, 'Congress acts intentionally and purposely in the disparate inclusion or exclusion.'" (quoting *Russello v. United States*, 464 U.S. 16, 23 (1983))).

Equally meritless is EPA's claim that the Delay Rule was authorized as a re-issuance or revision of the BAT standards in the ELG Rule, *see* 82 Fed. Reg. at 43,496 (stating that "the CWA expressly authorizes EPA to revise effluent limitations and standards"). As explained below, *infra* Argument Section IV, EPA failed to consider the mandatory statutory factors for issuing or revising effluent limits. Given that EPA did not comply with the Clean Water Act's requirements for issuing new or revised BAT guidelines and standards, and that no other provision of the Clean Water Act authorizes EPA to delay compliance with effluent limitations once promulgated,[9] the Clean Water Act does not authorize the Delay Rule.

Nor does the Administrative Procedure Act ("APA") authorize the Delay Rule. EPA did not cite the APA as authorizing the Delay Rule, in contrast to its earlier stay of the ELG Rule, which EPA purported to issue "under Section 705 of the APA," 5 U.S.C. § 705. 82 Fed. Reg. at 19,006. Instead, EPA claimed that the

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[9] As explained *supra* pages Argument Section V, the Clean Water Act forbids EPA from setting BAT compliance dates more than three years after issuance or revision of the BAT standards, as EPA did here.

Delay Rule was an exercise of its inherent authority to reconsider past decisions and its Clean Water Act authority. *See id*. at 43,496; *see also* Response to Comments, Index.12860, at 8, 10, resps. to i.c.i–iii.

Although the Delay Rule cannot be upheld based on a *post-hoc* rationalization, *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 50, even if EPA were to defend its action as authorized by the APA, the APA provides no legal basis for postponing the ELG Rule's compliance deadlines. Under the APA, "[w]hen an agency finds that justice so requires, it may postpone the effective date of action taken by it, pending judicial review." 5 U.S.C. § 705. As a threshold matter, the statutory language authorizing an agency to "postpone the effective date" of a rule means that an agency can stay only an effective date that has not yet passed, because one cannot postpone something that has already occurred. *See Safety-Kleen Corp. v. EPA*, No. 92-1629, 1996 U.S. App. LEXIS 2324, at *2-3 (D.C. Cir. Jan. 19, 1996) (per curiam); *Becerra v. U.S. Dep't of Interior*, 276 F. Supp. 3d 953, 964-65 (N.D. Cal. 2017). Yet here, EPA issued the Delay Rule in 2017, after the ELG Rule had gone into effect on January 4, 2016, 80 Fed. Reg. at 67,838, and therefore the Delay Rule did not "postpone" the ELG Rule's effective date.

Moreover, the APA authorizes a stay of an agency rule "pending judicial review," 5 U.S.C. § 705. *See Sierra Club v. Jackson*, 833 F. Supp. 2d 11, 34 (D.D.C. 2012). Yet here, EPA justified the Delay Rule not because of pending

litigation, but because of the agency's pending reconsideration of the ELG Rule. *See* 82 Fed. Reg. at 43,496.

Finally, to stay a rule under 5 U.S.C. § 705, an agency must find that the four factors for a preliminary injunction have been met. *See Sierra Club*, 833 F. Supp. 2d at 30. EPA failed to make findings on the four preliminary injunction factors, and therefore the APA could not have authorized issuance of the Delay Rule.

In sum, neither of the two legal bases EPA cited to support the Delay Rule withstands scrutiny: EPA lacks inherent authority to postpone effective dates pending reconsideration; and the agency failed to comply with the Clean Water Act provisions for issuing or revising BAT guidelines and standards. Nor can the APA provision for staying a rule pending judicial review rescue the Delay Rule. Therefore, the Delay Rule was issued "in excess of statutory . . . authority" and must be "set aside" under the APA, 5 U.S.C. § 706(2), (2)(C). *See generally City of Arlington, Tex.*, 569 U.S. at 297 (noting that for federal agencies, "[b]oth their power to act and how they are to act is authoritatively prescribed by Congress, so that when they act improperly, no less than when they act beyond their jurisdiction, what they do is ultra vires"); *Nat'l Pork Producers Council*, 635 F.3d at 751 (holding that an EPA action that "exceeds the EPA's statutory authority . . . is *ultra vires* and cannot be upheld").

IV. EPA FAILED TO MAKE THE STATUTORILY REQUIRED FINDINGS TO ISSUE OR REVISE THE BEST AVAILABLE TECHNOLOGY EFFLUENT LIMITATIONS.

EPA claimed to issue the Delay Rule pursuant to its Clean Water Act authority to issue new and revised effluent limitations guidelines and standards. *See* 82 Fed. Reg. at 43,496 (claiming that "the CWA expressly authorizes EPA to revise effluent limitations and standards," and citing 33 U.S.C. §§ 1311(d), 1314(b), (g)(1), (m)(1)(A), 1317(b)(2)); Response to Comments, Index.12860, at 8, resp. to 1.c.i ("EPA's authority for the Postponement Rule rests upon the same authorities as the 2015 ELG Rule."), 10, resp. to 1.c.iii (citing various sections of the CWA as the legal basis for the Delay Rule).[10] However, EPA—by its own admission—failed to consider all of the required statutory factors for issuing or revising effluent limitations, and therefore EPA cannot rely on those Clean Water Act provisions as a legal basis for the Delay Rule.

For toxic pollutants discharged by point sources to navigable waters,[11] the Clean Water Act, 33 U.S.C. § 1311(b)(2)(A), requires that effluent limitations be achieved that are based on BAT, as determined in accordance with the factors in 33

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[10] *See also* EPA Reply at 3, *Ctr. for Biological Diversity v. Pruitt*, No. 4:18-cv-00050-JAS, ECF Doc. 42 (D. Ariz. May 18, 2018) (arguing that the Delay Rule "was promulgated under Section 1311 (and related authorities)").

[11] The Clean Water Act defines a "point source" as "any discernible, confined and discrete conveyance," 33 U.S.C. § 1362(14), and defines "navigable waters" as "the waters of the United States, including the territorial seas," *id.* § 1362(7).

U.S.C. § 1314(b)(2). Section 1314(b)(2)(B), in turn, requires that BAT be based on a consideration of "the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate." Congress intended BAT to be technology-forcing, to "push[] industries toward the goal of zero discharge as quickly as possible." *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985). Thus, this Court has held that BAT must be "based on the performance of the single best-performing plant in an industrial field," *Chemical Manufacturers Ass'n*, 870 F.2d at 226, and the Supreme Court has held that BAT limits must "represent[] a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges." *EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74 (1980).

This Court has held on multiple occasions that EPA has a mandatory duty to consider all of the factors in 33 U.S.C. § 1314(b)(2)(B) when issuing BAT standards. *See Tex. Oil & Gas Ass'n*, 161 F.3d at 928 (noting that the "CWA specifies several factors that must be considered by the EPA in determining BAT limits" and citing 33 U.S.C. § 1314(b)(2)(B)); *Chem. Mfrs. Ass'n v. EPA*, 870 F.2d 177, 196 (5th Cir.), *clarified on reh'g*, 885 F.2d 253 (5th Cir. 1989) (stating that

for BPT and BAT, "[i]n establishing each set of standards Congress required the EPA to consider a number of factors"); *Am. Petroleum Inst. v. EPA*, 858 F.2d 261, 264 n.4 (5th Cir. 1988), *clarified on denial of reh'g*, 864 F.2d 1156 (5th Cir. 1989) ("Before EPA selects BAT-level limitations, it is required to address . . . 'the process employed, the engineering aspects of the application of various types of control techniques [and] process changes,' and (2) cost, including 'the cost of achieving such effluent reduction[,] non-water quality, environmental impact [and] energy requirements.' 33 U.S.C. § 1314(b)(2)(B).").

EPA itself acknowledged in the 2015 ELG rulemaking that it must consider the factors in 33 U.S.C. § 1314(b)(2)(B) when issuing BAT standards. *See* 80 Fed. Reg. at 67,843. To support the BAT limits in the 2015 ELG Rule, EPA made findings on each of the statutory ELG factors. *See, e.g.*, TDD, Index.12840, at 8-6 to 8-25 (discussing evidence in the record on each of the statutory factors for BAT); 80 Fed. Reg. at 67,846-47, 67,854-56, 67,863-69 (same). Further, in the 2017 Delay Rule, EPA acknowledged that "in establishing BAT limitations, the CWA directs EPA to consider several factors." Response to Comments, Index.12860, at 9, resp. to 1.c.i.

Yet despite paying lip service to the statutory requirements, EPA considered only one of the statutory BAT factors when it issued the Delay Rule in 2017: the provision authorizing the agency to consider "such other factors as the

Administrator deems appropriate," 33 U.S.C. § 1314(b)(2)(B). Specifically, EPA claimed that, as an "other factor" under this provision, it could consider the reasonableness of compliance costs that would be incurred while EPA was reconsidering the ELG Rule. *See* Response to Comments, Index.12860, at 8, resp. to 1.c.i ("[H]ere, EPA is applying an 'other factor the Administrator deems appropriate' . . . . In essence, the uncertainty during this period of further rulemaking is an 'other factor' related to achievability that is part of the BAT determination.").

EPA did not make *any* findings on the six other factors that the Clean Water Act mandates be considered when promulgating BAT effluent limitations. This was no accident. EPA failed to consider all of the factors in 33 U.S.C. § 1314(b)(2)(B) based on the agency's view that it is sufficient to consider those factors in a future rulemaking. *See* 82 Fed. Reg. at 43,497 (stating that in "the next rulemaking," EPA would consider issues raised by petitions for reconsideration of the ELG Rule, "in conjunction with the statutory factors for determining BAT for these wastestreams"). But the Clean Water Act does not provide EPA with legal authority to issue or revise BAT limits based on a promise to consider the statutory BAT factors at a later date. *See generally Michigan v. EPA*, 135 S. Ct. 2699, 2711 (2015) ("[EPA's] action must be measured by what [it] did, not by what it might have done." (quoting *SEC v. Chenery Corp.*, 318 U.S. 80, 93-94 (1943))); *see also*

Pub. Citizen v. Fed. Motor Carrier Safety Admin., 374 F.3d 1209, 1216 (D.C. Cir. 2004) ("[T]he final rule is arbitrary and capricious because the agency neglected to consider a statutorily mandated factor."). This Court cannot uphold the Delay Rule on the basis that EPA might develop a record in the future reconsideration proceeding that supports altering the 2015 ELG Rule.

In addition to failing to be based "on a consideration of the relevant factors," *Motor Vehicle Manufacturers Ass'n*, 463 U.S. at 43, the Delay Rule is not "supported by 'substantial evidence'" in the record, *Dickinson v. Zurko*, 527 U.S. 150, 164 (1999). Since EPA did not consider the mandatory ELG factors in the Delay Rule, the only record evidence regarding the mandatory ELG factors comes from the 2015 ELG Rule, which supports the BAT limits and the original compliance deadlines for scrubber and bottom ash wastewater that EPA postponed in the Delay Rule. Even though EPA received petitions for reconsideration of the ELG Rule, EPA expressly disclaimed making any new findings on the mandatory ELG factors, stating that "EPA is not making any concession of error with respect to the [ELG Rule] rulemaking." 82 Fed. Reg. at 26,018.

Under the Clean Water Act, EPA cannot issue or revise BAT limitations without providing record evidence on each of the statutory factors that must be considered under 33 U.S.C. § 1314(b)(2)(B). Here, the Delay Rule is unlawful because there is no record evidence on each of the mandatory factors in 33 U.S.C.

§ 1314(b)(2)(B) supporting the postponement of the BAT limits EPA issued in 2015. Given that EPA purported to issue or revise the BAT limits but failed to consider the mandatory statutory factors for doing so, the APA requires the Court to "set aside" the Delay Rule because it was issued "in excess of statutory . . . authority." 5 U.S.C. § 706(2), (2)(C); *see generally City of Arlington, Tex.*, 569 U.S. at 297; *Nat'l Pork Producers Council*, 635 F.3d at 751.

V. THE DELAY RULE VIOLATES THE CLEAN WATER ACT PROVISION REQUIRING COMPLIANCE WITH ELGS WITHIN THREE YEARS.

The Delay Rule sets the earliest compliance deadline for bottom ash and FGD wastewater as November 1, 2020, 40 C.F.R. §§ 423.11, 423.13, 423.16, nearly five years after the bottom ash and FGD limitations were promulgated on November 3, 2015, 80 Fed. Reg. 67,838. By extending these compliance deadlines, EPA violated the Clean Water Act provision that requires compliance with the ELGs no later than three years after the limitations were promulgated, 33 U.S.C. § 1311(b)(2)(C)[12] (requiring "compliance with [BAT] effluent limitations . . . as expeditiously as practicable but in no case later than three years after the date such limitations are promulgated . . . , and in no case later than March 31, 1989"). *See also Chem. Mfrs. Ass'n*, 870 F.2d at 242 (finding that Congress

[12] Subsections (D) and (F) are also applicable and include identical language requiring that compliance with effluent limitations be achieved within three years after promulgation.

intended the three-year statutory deadline to be mandatory, with EPA's discretion limited to how it enforces the deadline).[13]

The Clean Water Act's requirement that compliance with BAT limits be achieved within three years is consistent with its overall goal to eliminate all discharges of pollution into navigable waters, 33 U.S.C. § 1251(a)(1), and its framework for achieving that goal. The Act requires that EPA set effluent limits based on BAT for pollutants including toxic metals. *See id.* §§ 1311(b)(2)(A)-(F), 1314(a)(4). To facilitate the adoption and revision of effluent limitations, the Act also requires that EPA develop and publish ELGs that characterize the effluent discharges from a given industry, identify the level of pollution control that is

[13] Congress initially set a March 31, 1989 deadline for compliance with BAT effluent limitations, Pub. L. No. 100-4, tit. III, § 301, 101 Stat 7 (1987), with the intention that EPA would promulgate ELGs setting forth those BAT limits before the deadline. Additionally, Congress amended 33 U.S.C. § 1319 to allow EPA to address issues involving compliance with BAT limits through enforcement discretion. *See* 33 U.S.C. § 1319(a)(5)(A) ("Any [enforcement] order issued . . . shall specify a time for compliance . . . not to exceed a time the Administrator determines to be reasonable in the case of a violation of a final deadline, taking into account the seriousness of the violation and any good faith efforts to comply with applicable requirements."); H.R. Rep. No. 99-1004, at 115-16 (1986) (Conf. Rep.) ("If dischargers in an entire category are unable to meet the March 31, 1989, deadline provided in the conference substitute as a result of the Administrator's failure to promulgate effluent limitations in sufficient time to allow for compliance by such date, non-compliance resulting from the Administrator's delay can be dealt with under EPA's current post-1984 deadline enforcement policy."). Based on this legislative history, this Court has held that EPA lacks discretion to extend compliance deadlines for BAT limits beyond the three year outer bound set forth in the statute. *See Chem. Mfrs. Ass'n*, 870 F.2d at 242.

possible in light of available technologies, and specify the relevant factors for determining what constitutes BAT. *Id.* § 1314(b). To ensure that governing regulations reflect advances in control technology, the Clean Water Act requires EPA to review and, if appropriate, revise these effluent limitations and underlying ELGs at regular intervals. *See id.* §§ 1311(d) (all effluent limitations "*shall* be reviewed at least every five years, and, if appropriate, revised") (emphasis added), 1314(b) ("the Administrator *shall* . . . publish . . . regulations, providing guidelines for effluent limitations, and, at least annually thereafter, revise, if appropriate, such regulations") (emphasis added).

Here, EPA issued BAT determinations for the steam electric power plant industry on November 3, 2015. 80 Fed. Reg. 67,838. Three years from issuance of the BAT determinations is November 3, 2018. The Delay Rule sets the earliest compliance deadlines for BAT as November 1, 2020, 40 C.F.R. §§ 423.11, 423.13, 423.16, and allows permitting authorities to extend the compliance deadlines up to December 31, 2023, *id.* § 423.13, which far exceeds the three-year deadline in the Clean Water Act. 33 U.S.C. § 1311(b)(2)(C); *Chem. Mfrs. Ass'n*, 870 F.2d at 242.[14]

[14] The 2015 ELG Rule also allowed extensions of the compliance deadline up to December 31, 2023. 80 Fed. Reg. at 67,854. Unlike the Delay Rule, however, the 2015 ELG Rule required compliance for all effluent limitations "as soon as possible" on or after the three-year deadline (November 1, 2018), whereas the Delay Rule does not require compliance until at least five years after the ELG

In its Response to Comments on the Delay Rule, EPA claimed that it did not violate the Clean Water Act because for each wastestream, some of the ELG Rule's limitations were effective immediately after issuance of the 2015 rule, and the Delay Rule does not change those limits. *See* Response to Comments, Index.12860, at 9, resp. to 1.c.i. However, EPA cannot cure its violation of the statute regarding some effluent limitations by pointing to its compliance with respect to other effluent limitations. The Delay Rule extends the timeframe for compliance with the bottom ash and FGD BAT limits well beyond the statutory requirement of compliance within three years, and thus violates 33 U.S.C. § 1311(b)(2)(C)—regardless of whether the BAT limits for other wastestreams require compliance within three years.[15]

Rule's effluent limitations were promulgated. 82 Fed. Reg. at 43,496. Even if EPA takes the position that the Delay Rule re-promulgated effluent limitations, the rule still violates the requirement that compliance deadlines be no later than three years after the limitations were promulgated. The Delay Rule was issued on September 18, 2017, and the Agency set the earliest compliance deadline for bottom ash and FGD wastes as November 1, 2020, which is more than 3 years after issuance of the Delay Rule, in violation of 33 U.S.C. § 1311(b)(2)(C). Moreover, as noted above, the Delay Rule has created substantial uncertainty around implementation of the ELG Rule that has, for many power plants, caused state NPDES permitting authorities to extend compliance deadlines out to December 31, 2023 rather than setting the compliance date "as soon as possible" on or after the new November 1, 2020 deadline. *Supra* Argument Section II.

[15] Specifically, in the 2015 ELG Rule, EPA established limits for "legacy wastewater" – i.e., wastewater that was generated prior to the compliance deadlines for the new, more stringent effluent limitations established in the rule – that had an effective date in January 2016. *See* 80 Fed. Reg. at 67,838, 67,854-55, 67,859, 67,883.

Additionally, EPA defended the Delay Rule by stating that the Clean Water Act's three-year compliance deadline requirement "could" be read to apply only to BAT limits promulgated before the March 31, 1989 date included in the provision. *See* Response to Comments, Index.12860, at 9, resp. to 1.c.i. To support this noncommittal point, EPA stated that the statute is silent for "post-1989 ELGs" and cited to a 1990 U.S. Environmental Appeals Board ("EAB")[16] decision, *In re Star-Kist Caribe, Inc.*, 3 E.A.D. 172 (EAB 1990), involving a different provision of 33 U.S.C. § 1311. *Id.* But this interpretation of 33 U.S.C. § 1311(b)(2)(C) would mean that Congress intended to impose no deadline for compliance with ELGs promulgated after 1989, which would be contrary to the prescriptive timelines Congress set out to achieve the national goal, as described above. *See* 33 U.S.C. §§ 1311(b)(2)(C), 1311(d), 1314(b).

The provision at issue in *In re Star-Kist Caribe, Inc.*, contains different language and serves a very different function than the provision at issue in this case. Section 1311(b)(1)(C) states that any effluent limitation for point sources that is more stringent than the best practicable control technology ("BPT"),[17]

[16] The EAB is the final EPA decision maker on administrative appeals under all major environmental statutes that EPA administers. *See* 57 Fed. Reg. 5,320 (Feb. 13, 1992).

[17] BPT standards were the Clean Water Act's initial requirements for wastewater treatment at all point sources and were required to be met by July 1, 1977. 33 U.S.C. § 1311(b)(1)(A). They were required to be less stringent than BAT standards, in that EPA was required to base them on the average of the best

including those necessary to meet state or federal water quality standards, must be achieved "not later than July 1, 1977." 33 U.S.C. § 1311(b)(1)(C). The EAB found that this deadline was included in the statute "to ensure full compliance with pre-July 1, 1977 state water quality standards no later than July 1, 1977." *In re Star-Kist Caribe, Inc.*, 1990 WL 324290, at *4. In light of this deadline, the EAB held that EPA has no authority to impose compliance deadlines in NPDES permits for water-quality-based effluent limitations beyond July 1, 1977 unless either the water quality standard itself or its implementing regulations "can be fairly construed as authorizing a schedule of compliance."[18] *Id.* at *2. Otherwise, under the plain language of 33 U.S.C. § 1311(b)(1)(C), EPA is required to ensure that all NPDES permits contain "limitations necessary to meet whatever state water quality standards are in effect at the time of permit issuance, regardless of when the standards were adopted or revised." *Id.* at *7.

The EAB's allowance in *In re Star-Kist Caribe, Inc.* for schedules of compliance to implement water quality standards that expressly authorize such schedules does not support EPA's authority to issue the Delay Rule. The BAT

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performing facilities in the industry and to consider costs in relation to benefits in setting those standards. *See id.* § 1314(b)(1)(B).

[18] A schedule of compliance is "a schedule of remedial measures including an enforceable sequence of actions or operations leading to compliance with an effluent limitation, other limitation, prohibition, or standard." 33 U.S.C. § 1362(17).

provision at issue in this case, 33 U.S.C. § 1311(b)(2)(C), specifically includes an interim deadline (i.e., three years) by which limitations must be achieved after they are promulgated, indicating a clear congressional intent to impose a three-year outer bound on compliance with any effluent limitations promulgated after March 31, 1989. *See Chem. Mfrs. Ass'n*, 870 F.2d at 242; *see also Burlington N. & Santa Fe Ry. Co.*, 548 U.S. at 63 ("We normally presume that, where words differ as they differ here, 'Congress acts intentionally and purposely in the disparate inclusion or exclusion.'" (quoting *Russello*, 464 U.S. at 23)).

Moreover, unlike the provision at issue in *In re Star-Kist Caribe, Inc.*, here there is no issue concerning the interplay between the Clean Water Act and any separate state or federal standards. *See In re Star-Kist Caribe, Inc.*, 1990 WL 324290, at *3-4. The only issue here is whether EPA may interpret 33 U.S.C. § 1311(b)(2)(C) not to impose a three-year outer bound on compliance. Such an interpretation would be contrary to the language and design of the Clean Water Act. *See McCarthy v. Bronson*, 500 U.S. 136, 139 (1991) ("In ascertaining the plain meaning of [a] statute, the court must look to the particular statutory language at issue, as well as the language and design of the statute as a whole." (quoting *K Mart Corp. v. Cartier, Inc.*, 486 U.S. 281, 291 (1988))). Congress's goal in enacting the Clean Water Act was to produce progressively cleaner waters—and ultimately eliminate all pollution—through the ratcheting down of

effluent limits over time as technology advances. 33 U.S.C. § 1251(a)(1), (2), (6). Mandatory revisions to standards would be meaningless without mandatory deadlines for compliance with the revised standards. *See Nat. Res. Def. Council*, 2018 WL 3189321, at *8 (finding that agency lacked the authority to indefinitely delay implementation of penalty increases "[i]n the face of . . . a clear statutory command" that established a "highly circumscribed schedule" for imposing the increases (quoting *Nat. Res. Def. Council, Inc. v. Reilly*, 976 F.2d 36, 41 (D.C. Cir. 1992))); *Nat. Res. Def. Council v. EPA*, 489 F.3d 1364, 1373-74 (D.C. Cir. 2007) (holding that EPA lacked authority under the Clean Air Act to extend compliance deadlines beyond the three-year maximum in the statute).

Courts look to the "title of a statute or section [to] aid in resolving an ambiguity in the legislation's text." *Immigration & Naturalization Serv. v. Nat'l Ctr. for Immigrants' Rights, Inc.*, 502 U.S. 183, 189-90 (1991) (citing *Mead Corp. v. Tilley*, 490 U.S. 714, 723 (1989)). The title of 33 U.S.C. § 1311(b) is "Timetable for achievement of objectives," and the first sentence begins "[i]n order to carry out the objective of this chapter . . ." (i.e., the Clean Water Act). 33 U.S.C. § 1311(b). This is further support that Congress intended the compliance timetables to further all Clean Water Act objectives, including reductions in pollution discharges through the mandatory revision of, and compliance with, ELGs and effluent limitations at regular intervals. *Id.* § 1311(d).

The legislative history of the Act supports this interpretation as well. The Conference Report accompanying the Water Quality Act Amendments of 1987 explained the congressional intent for ELGs promulgated for an industry group or subcategory after the deadline of March 31, 1989. The conferees stated that if the dischargers in an entire category were unable to meet the March 31, 1989 deadline as a result of EPA's failure to promulgate effluent limitations in time to allow compliance by the deadline, EPA would specify "a schedule of compliance as expeditiously as practicable, but not later than three years after permit issuance." H.R. No. 99-1004, at 116 (1986) (Conf. Rep.).

Finally, EPA's suggestion that the three-year deadline applies only to limits issued prior to 1989 is directly contrary to the agency's position in other Clean Water Act rulemakings. As EPA has acknowledged, the Agency "has used the reference to three years in the provisions to allow three years to come into compliance for ELGs after 1989." Response to Comments, Index.12860, at 9, resp. to 1.c.i. Furthermore, EPA has not stated whether this is no longer the Agency's interpretation of 33 U.S.C. § 1311(b)(2)(C) nor has EPA provided a reasoned basis to support a change in its interpretation. *See Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2125-26 (2016) (when an agency departs from its prior position, "the agency must at least 'display awareness that it is changing position' and 'show that there are good reasons for the new policy'" (quoting *FCC*

v. Fox Television Stations, Inc., 556 U.S. 502, 515 (2009) (emphasis removed))); *FCC v. Fox Television Stations, Inc.*, 556 U.S. at 515 ("[T]he requirement that an agency provide reasoned explanation for its action would ordinarily demand that it display awareness that it *is* changing position. An agency may not, for example, depart from a prior policy *sub silentio* or simply disregard rules that are still on the books."); *Handley v. Chapman*, 587 F.3d 273, 281-82 (5th Cir. 2009) ("An agency action representing a policy change . . . . must be permissible under the statute; there must be good reasons for it; and the agency must believe that the new policy is better.").

In sum, the Delay Rule violates the Clean Water Act's requirement that compliance deadlines for BAT limitations be no later than three years after the limitations were promulgated, 33 U.S.C. § 1311(b)(2)(C).

CONCLUSION

For the foregoing reasons, the Court should find that the Delay Rule was issued without legal authority and is arbitrary and capricious, and should vacate the Delay Rule.

Dated: July 12, 2018

Respectfully submitted,

/s/ Thomas J. Cmar
Thomas J. Cmar
Earthjustice
1101 Lake St., Ste. 405B
Oak Park, IL 60301
(312) 257-9338
tcmar@earthjustice.org

Matthew Gerhart
3639 N. Clayton St.
Denver, CO 80205
(510) 847-7721
megerhart@gmail.com

Counsel for Petitioners Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.

/s/ Gabriel Clark-Leach
Gabriel Clark-Leach
Environmental Integrity Project
1206 San Antonio Street
Austin, Texas 78701
(512) 637-9478
gclark-leach@environmentalintegrity.org

Counsel for Petitioners Environmental Integrity Project, PennEnvironment, Inc., Chesapeake Climate Action Network, Physicians for Social Responsibility, Chesapeake, Inc., and Prairie Rivers Network

/s/ Casey Roberts
Casey Roberts
Sierra Club
1536 Wynkoop St., Suite 312
Denver, CO 80202
(303) 454-3355
casey.roberts@sierraclub.org

Joshua D. Smith
Sierra Club
2101 Webster St., Suite 1300
Oakland, CA 94612
(415) 977-5560
(510) 208-3140 (fax)
joshua.smith@sierraclub.org

Counsel for Petitioner Sierra Club

CERTIFICATE OF SERVICE

I hereby certify that on July 12, 2018, the foregoing brief was electronically filed with the Clerk of the Court using the CM/ECF system, which will send notification of said filing to the attorneys of record who have consented to electronic service.

/s/ Thomas J. Cmar
Thomas J. Cmar

Counsel for Petitioners Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.

CERTIFICATIONS UNDER ECF FILING STANDARDS AND CERTIFICATE OF COMPLIANCE WITH WORD LIMIT

Pursuant to paragraph A(6) of this Court's ECF Filing Standards, I hereby certify that (1) required privacy redactions have been made, 5th Cir. R. 25.2.13; (2) the electronic submission is an exact copy of the paper document, 5th Cir. R.25.2.1; and (3) the document has been scanned for viruses with the most recent version of a commercial virus scanning program and is free of viruses.

I certify that this brief contains 11,726 words, excluding the parts of the brief exempted by Fed. R. App. P. 32(f) and 5th Cir. R. 32.2 and as counted by counsel's word processing system, and thus complies with the applicable word limit established in Federal Rule of Appellate Procedure 32(a)(7)(B)(i).

Dated: July 12, 2018

/s/ Thomas J. Cmar
Thomas J. Cmar

Counsel for Petitioners Clean Water Action, Sierra Club, and Waterkeeper Alliance, Inc.

RELEASE DATE: AUGUST 12, 2010
REVISED: MAY 11, 2012

west virginia department of environmental protection

Permitting Guidance for Surface Coal Mining Operations to Protect West Virginia's Narrative Water Quality Standards, 47 C.S.R. 2 §§ 3.2.e and 3.2.i

INTRODUCTION

The purpose of this Permitting Guidance ("Guidance") is to assist West Virginia Department of Environmental Protection ("DEP") permit writers in developing site-specific National Pollutant Discharge Elimination System ("NPDES") permit conditions for surface coal mining operations using a holistic watershed management approach through the use of biological and chemical monitoring, whole effluent toxicity ("WET") testing, and the development of Aquatic Ecosystem Protection Plans ("AEPP") and, where necessary, Adaptive Management Plans ("AMP") to protect the State's narrative water quality standards. These standards are found in West Virginia's *Code of State Rules*, which states, in pertinent part, "No significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems shall be allowed."[1] These procedures shall take effect immediately.[2]

This Guidance does not apply to outlets that are primarily precipitation induced, or for which the activities associated with those outlets have been substantially completed.[3]

REASONABLE POTENTIAL ANALYSIS

In deciding which permit conditions to include in a permit, the first thing a permit writer must do is perform a reasonable potential analysis and document the same in the Statement of Basis for the permit. If the applicant cannot demonstrate, by means of its chemical and biological monitoring and the control measures outlined in its AEPP, that it does not have reasonable potential ("RP") to cause or contribute to an excursion above the narrative criteria, the permit writer should treat new or expanded discharges as if they have RP and include WET limits in the permit, in accordance with 40 C.F.R. § 122.44(d)(1)(v).

At permit reissuance, DEP will use all valid and representative data to determine, on a case-by-case basis, whether an existing discharge causes, has the reasonable potential to cause, or contributes to an excursion from the narrative water quality criteria. Where DEP concludes that an existing outlet has RP, the permit will include WET limits. In cases where insufficient data is available to make a determination of RP upon permit reissuance, the permit writer will place WET monitoring requirements and triggers in the permit in order to determine RP (or lack of

[1] 47 C.S.R. 2 § 3.2.i

[2] In light of the changing nature of the policy concerns addressed herein, this document is intended to be dynamic and will likely be modified in the future as technology and best management practices develop and improve.

[3] The term "substantially complete" shall mean that the operation is past the point when measures that could be undertaken under either an AEPP or an AMP could be effective in reducing the operation's impact on the aquatic ecosystem.

RP). If the monitoring shows RP, the permit writer will reopen the permit to include WET limits.

PERMIT CONDITIONS

If the applicant has RP, the permit writer should use best professional judgment to establish permit terms and conditions and determine whether the proposed control measures are sufficient to protect the narrative water quality standards. The permit writer should, depending on the type of permit being issued, establish the following conditions in the permit, each of which is discussed more completely below:

New and Expanded Discharge Permits

- WET Limits
- Chemical Monitoring
- In-Stream Biological Monitoring
- Aquatic Ecosystem Protection Plan (AEPP)
- Adaptive Management Plan (AMP), if necessary
- Reopener Clause

Permits at Reissuance

- WET Monitoring
- Chemical Monitoring
- In-Stream Biological Monitoring
- Aquatic Ecosystem Protection Plan (AEPP)
- Adaptive Management Plan (AMP), if necessary
- Reopener Clause

NEW AND EXPANDED DISCHARGE PERMITS

This Guidance does not apply to outlets that are primarily precipitation induced.

WET Limits

If the applicant cannot demonstrate, by means of its chemical and biological monitoring and the control measures outlined in its AEPP, that it does not have RP, the permit writer should treat new and expanded mining discharges as if they have RP and include WET limits in the permit, as prescribed by 40 C.S.R. § 122.44(d)(1)(v).

The permit writer shall establish WET limits using all applicable rules and guidance, including the EPA's 1991 *Technical Support Document for Water Quality-based Toxics Control* ("TSD").[4] To develop the WET limits, the permit writer shall consider the in-stream waste concentration of the effluent in the immediate receiving stream and calculate it so as to result in no greater than 1.0 chronic toxicity unit (TU_c) and 0.3 acute toxicity unit (TU_a) at the edge of the appropriate mixing zones, where applicable.

[4] EPA/505/2-90-001 PB91-127415

The permittee is required to perform WET testing quarterly. The TSD requires use of the most sensitive available surrogate organism (*ceriodaphnia dubia*) for chronic toxicity testing of effluents. DEP requires TDS, conductivity, sulfate, and bicarbonate analyses for each aliquot used in WET testing.

If WET testing shows noncompliance with the specified limitations prescribed in the permit, the permittee shall resample and test the effluent within 30 days. If the second test shows compliance, the permittee shall continue WET testing in accordance with the permit requirements. However, if the second test shows noncompliance, the permittee must, within 60 days, submit an AMP (as more fully described below) identifying actions it will take to achieve compliance with the WET discharge limitations. If WET testing shows noncompliance with the specified limitations prescribed in the permit, but the aquatic ecosystem remains healthy (as evidenced by acceptable data retrieved at the biological monitoring stations), the DEP shall reevaluate the WET limits placed in the permit to assure that such limits take into consideration the appropriate dilution factors, mixing, and the effects of the discharge on the downstream monitoring stations.

Chemical Monitoring

In addition to what is required for monitoring associated with the protection of numeric standards, the permit will require twice-per-month effluent monitoring for TDS, specific conductance, sulfate, alkalinity, pH, calcium, magnesium, sodium, and potassium upon commencing the permitted activity. The permittee shall monitor the same sampling suite quarterly, taking samples at approximately the same time as the collection of any biologic sample(s). The results of concurrent monitoring of WET, dissolved ions, and biological conditions will provide a wealth of information to guide future decisions and possible refinements of this Guidance.

In-Stream Biological Monitoring

The permit will require the maintenance of acceptable ecosystem health in waters of the State. Biological monitoring will be required prior to, and then regularly over the life of, the permitted activity. An applicant must submit a monitoring plan for agency approval that proposes in-stream BAS that allow a holistic assessment of the aquatic ecosystem and a determination of the impacts of the permitted activity.

The applicant should work with the permit writer and the DEP biologist to establish a monitoring strategy with the most appropriate monitoring locations for a holistic evaluation of the aquatic ecosystem. All biologic sampling shall be done in accordance with the West Virginia Division of Natural Resources' scientific collection permit and DEP's West Virginia Stream Condition Index ("WVSCI") protocol. The applicant shall submit to DEP for approval a monitoring plan that is consistent with WVDEP's Watershed Assessment Branch 2009 Standard Operating Procedures, Chapter 4,[5] which must include the following:

[5] http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/SOP%20Doc/WAB%20SOP.pdf

- BASs shall be located at the first appropriate riffle/run habitat downstream of new outlets in a perennial stream segment. Ideally, the BAS will be located such that future impacts to the stream are attributable solely to the permitted activity. Where there are a number of outlets in a small geographic area, it is not necessary to establish a BAS downstream of each outlet, so long as a sufficient number of BASs are established to allow for a holistic assessment of the aquatic ecosystem.
- Additional BASs should be situated on a site-specific basis, but generally should be located upstream and downstream of the confluence of the immediate receiving stream and the stream into which it drains, which allows the aquatic ecosystem's health to be assessed in its entirety. In establishing these stations, the permittee should avoid a multiplicity of stations in a short stream segment. Instead, there should be a sufficient number of these additional stations to allow for a holistic assessment of the aquatic ecosystem.
- If the first available location for a BAS is potentially influenced by other watershed activities and stressors, then a clear link between the permit controls and biological conditions at the station may not be possible. Those scenarios will require baseline documentation of the other potential stressors and tracking of watershed activities over time. The applicant will also have to submit a monitoring plan in accordance with the provisions set forth in "Chemical Monitoring" above.
- Additional monitoring stations may be designated further upstream or downstream at points that are useful in determining the entire aquatic ecosystem's health. Such stations may be beneficial in identifying actions the applicant can take to improve the overall health of the aquatic ecosystem.
- The plan should include chemical and biological monitoring at the BAS prior to the start of the permitted activity.

If the agency finds the condition of the aquatic ecosystem at the assessment stations prior to initiation of the permitted activity to be satisfactory, taking into account all potentially applicable criteria, then the acceptable future biological condition is a WVSCI score greater than or equal to the WVSCI value representing the 5th percentile of reference (currently 68.0). If the agency finds the condition of the aquatic ecosystem at the assessment stations is less than satisfactory, taking into account all potentially applicable criteria, then the applicant shall identify existing conditions within the watershed that may be contributing to the problem. If a TMDL addressing biological impairment for ionic stress is not in effect, a WVSCI score greater than or equal to the baseline value would represent an acceptable future condition.

However, permit writers should be aware that a single point in a stream may not represent the overall health of the aquatic ecosystem. WVSCI is a tool to be used as a primary indicator of stream health, but not the sole criteria; if the WVSCI score suggests a potential problem, DEP shall conduct an assessment of the health of the aquatic ecosystem as a whole. In determining whether a lower WVSCI score represents an unacceptable condition, the DEP will utilize best professional judgment in a manner comparable to the discretion it exercises in listing streams as biologically impaired pursuant to § 303(d) of the Clean Water Act, including a holistic examination of the health of the aquatic ecosystem.

Aquatic Ecosystem Protection Plan (AEPP)

New and expanded discharge permit applications shall include an AEPP for agency review and approval, and the permit writer shall use the control measures outlined therein as part of his or her RP analysis, as outlined more fully above. The permittee shall use the measures outlined in its AEPP as a means of maintaining the health of the aquatic ecosystem and complying with the State's narrative water quality standards.

An AEPP describes control measures the applicant will implement to achieve WET limitations and minimize adverse biological impacts to the aquatic ecosystem surrounding the permitted activity. The plan should also include controls designed to lower the magnitude of pollutant loading associated with mining activities. If the agency cannot conclude that the proposed measures are reasonably expected to result in compliance, then the permit will not be issued. The applicant should consider all appropriate options when selecting and implementing control measures. Where an initial AEPP fails to achieve WET compliance and acceptable ecosystem conditions, the applicant must amend its AEPP to include additional measures that enable it to comply with WET limits.

The applicant can implement any of a number of controls in an attempt to protect the aquatic ecosystem and to reduce or minimize the ionic strength in the stream. Some examples of control measures that may be included in the AEPP include, but are not limited to, the following:

- Test overburden to determine the material that contains sulfur or other ionic strength-bearing material, so it can be isolated through material handling;
- Minimize the amount of area disturbed at one time;
- Minimize stormwater contact with pulverized material;
- Increase stream buffer zones;
- Minimize fill areas;
- Mine down-dip instead of up-dip;
- Cap fills and spoil so as to minimize pass-through of rain water;
- Re-vegetate any disturbed areas to minimize runoff;
- Develop a plan to reduce or prevent ionic stress;
- If necessary, conduct TRE/TRI pursuant to EPA's TSD;
- Segregate weathered rock and return to surface;
- Expedite reclamation;
- Enhance riparian plantings;
- Limit the number of active fills;
- Restore natural streams.

Because many of the controls outlined in the AEPP are related to onsite best management practices, the~~y~~ onsite controls will need to be addressed in the mining permit issued pursuant to the *West Virginia Surface Coal Mining & Reclamation Act* ("Article 3 permit"). The entire AEPP must be included as an attachment to the NPDES permit application to allow for agency review and evaluation.

Adaptive Management Plan (AMP)

A "new and expanded discharge" permittee shall submit an AMP to DEP within 60 days of failing two WET tests in a 30-day period. An AMP is more than merely monitoring activities and occasionally changing them; it involves exploring alternative ways to meet environmental objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions.[6] For purposes of this Guidance, the AMP outlines the measures the permittee will take to achieve the chronic toxicity permit limitations (1.0 TU_c). This plan shall include, at a minimum, a thorough review of the AEPP to determine what, if any, changes can be made to the control measures outlined therein that will bring the permittee back into compliance with its WET limits.

The permittee may also implement a Toxicity Reduction Evaluation (TRE)/Toxicity Identification Evaluation (TIE)[7] plan to obtain compliance with final effluent limits or triggers for chronic toxicity. The purpose of a TRE is to investigate the causes and to identify corrective actions for difficult effluent toxicity problems.[8] A TRE is a site-specific study conducted in a stepwise process to narrow the search for effective control measures for effluent toxicity. TREs are designed to identify the causative agents of effluent toxicity, isolate the sources of the toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity. The ultimate objective of a TRE is for the permittee to achieve the limits or requirements for effluent toxicity contained in the permit and thereby attain the water quality standards for the receiving waters.[9]

A TIE is a set of procedures to identify the specific chemicals responsible for effluent toxicity, and TIE methods are an integral part of the protocols for TREs. TIE procedures are performed in three phases: characterization, identification, and confirmation. In each phase, the permittee shall use aquatic organism toxicity tests to track toxicity at each step of the procedure. In most cases, these are abbreviated or shortened toxicity tests.

If the TRE/TIE identifies toxic pollutants that can be regulated through the use of numeric limits, the permit writer shall put a numeric limit for those pollutants in the permit, in accordance with 47 C.S.R. 2 § 9 and 40 C.F.R. § 122.44(d)(1)(vi)(A). If the TRE/TIE does not identify toxic pollutants that can be regulated through the use of numeric limits, the WET limits shall remain in the permit.

Reopener Clause

The permit will contain an explicit reopener clause allowing DEP to modify or revoke the permit if prescribed controls do not attain and maintain applicable water quality standards. The permittee may also request that the permit be reopened if, after a

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6 *See*, U.S. Department of the Interior's *Technical Guide: Adaptive Management*

7 Although TRE/TIE is briefly outlined in this document, permit writers and permittees shall refer to EPA's TSD and the guidance documents listed therein for specific direction on how to conduct these evaluations.

8 EPA's TSD, p. 114

9 Id.

sufficient amount of data has been collected, the agency determines that RP does not exist, and the permittee can request an adjustment to its monitoring activities through a modification of the permit.

PERMITS AT REISSUANCE

These permit conditions do not apply to outlets that are primarily precipitation induced or for which the activities associated with the outlets are substantially complete at the time of reissuance. If the agency determines at the time of reissuance that permitted outlets have not been constructed, the requirements outlined in "New and Expanded Discharge Permits" above will apply. Otherwise, DEP will establish the following permit conditions:

Wet Monitoring and Limits

Where there is not sufficient WET, chemical, and/or biological assessment data to perform a reasonable potential analysis at permit reissuance, the permit writer will assign WET monitoring to determine reasonable potential to cause or contribute to an excursion above the narrative criteria, as prescribed by 40 C.F.R. § 122.44(d)(1)(ii).

The permit writer will establish WET monitoring triggers using all applicable rules and guidance, including EPA's TSD. In developing the WET trigger, the permit writer will consider the in-stream waste concentration of the effluent in the immediate receiving stream and calculate it so as to result in no greater than 1.0 chronic toxicity unit (TU_c) and 0.3 acute toxicity unit (TU_a) at the edge of the appropriate mixing zones, where applicable.

The permittee is required to perform WET monitoring quarterly. The TSD requires use of the most sensitive available surrogate organism (*ceriodaphnia dubia*) for chronic toxicity testing of effluents. DEP requires TDS, conductivity, sulfate, and bicarbonate analyses for each aliquot used in WET testing.

If WET monitoring shows an exceedance of the specified triggers prescribed in the permit, the permittee shall resample and test the effluent within 30 days. If the second test shows compliance, the permittee shall continue WET monitoring in accordance with the permit requirements. However, if the second test shows an exceedance, the permittee must, within 60 days, submit an AMP identifying actions it will take to achieve compliance with the WET triggers. The permittee must also submit a permit modification to place WET limits in the permit.

Chemical Monitoring

The permit will require enhanced effluent and receiving water monitoring of dissolved ions for permits upon reissuance.

The permit will require twice-per-month effluent monitoring for TDS, specific conductance, sulfate, alkalinity, pH, calcium, magnesium, sodium, and potassium. The same sampling suite is required for all established stream monitoring stations. The results of concurrent monitoring of WET and dissolved ions testing at the discharge and

in-stream monitoring locations will provide a wealth of information to guide future decisions and possible refinements to this protocol.

In-Stream Biological Monitoring

The permit will require the maintenance of acceptable ecosystem health in waters of the State. DEP will require in-stream biological monitoring regularly over the remaining life of the permitted activity. The permittee must submit a monitoring plan for agency approval that proposes in-stream BAS that allow a holistic assessment of the aquatic ecosystem and a determination of the impacts of the permitted activity. To that end, biological monitoring as discussed above may be applied as appropriate.

Adaptive Management Plan (AMP)

A permittee with a reissued permit shall submit an AMP to DEP within 60 days of exceeding two WET triggers in a 30-day period. The AMP shall include appropriate control measures as outlined in "Aquatic Ecosystem Protection Plan" above that are designed to obtain compliance with WET triggers, maintain the health of the aquatic ecosystem, and comply with the State's narrative water quality standards. If the WET testing results continue to exceed the established permit trigger(s), then the permittee has exhibited a reasonable potential to cause or contribute to an excursion above West Virginia's narrative water quality standards (specifically, 47 C.S.R. 2 §§ 3.2.e and 3.2.i), and the permit writer will reopen the permit to impose WET limits. Alternatively, the AMP may allow the permittee to conduct TRE/TIE (as outlined above), in an effort to identify toxic pollutants that can be regulated through the imposition of numeric limits in the permit.

Reopener Clause

The permit will contain an explicit reopener clause allowing DEP to modify or revoke the permit if prescribed controls do not attain and maintain applicable water quality standards. The permittee may also request that the permit be reopened if, after a sufficient amount of data has been collected, the agency determines that RP does not exist, and the permittee can request an adjustment to its monitoring activities through a modification of the permit.

REFERENCES

EPA's *Policy on the Use of Biological Assessments and Criteria in the Water Quality Program* (May 1991)

EPA's *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001 (March 1991)

EPA's *NPDES Permit Writers' Manual*, EPA-833-B-96-003

RATIONALE PAGE

NPDES Number: **WV1013815 (NPR-4-Minor)** County: Clay

Company Name: FOLA COAL COMPANY LLC

Facility Name: Surface Mine #1, Haulroad #1, Surface Mine #4A

SMA/Permit No.: S200502, S200605

Other Apps:

Date of Draft: 10/31/2013

Permit Writer: Nicholas Payne

Region: Philippi

1. New or expanded discharge? **NO**

2. Facility eligible for General Permit? **NO**

3. Basis for effluent limitation:

A. Determine uses of each receiving stream.

Stream Uses	Stream Name
1	CANNEL COAL HL
1	RIGHT FK/LEATHERWOOD CK
1	ROCKLICK FK

B. Parameters of concern: **YES** pH **YES** Fe **YES** Mn
YES Al (D) **YES** Al (T) **YES** Others

Specify Others: Selenium

C. Justification Review: On December 3, 2012 Fola Coal Company LLC submitted a reissuance application for WV1013815 to maintain and operate a Haulroad, Surface Mine and Highwall/Auger Mine in the Lower Coalburg, Middle Coalburg, Upper Coalburg, Stockton, Stockton A, 5-Block, Middle Kittanning, Upper Kittanning and Mohoning seams of coal. The operation will discharge treated water and storm water into Rocklick Fork and Cannel Coal Hollow of Right Fork of Leatherwood Creek and Right Fork of Leatherwood Creek of the Elk River. The operation is located 1.0 miles southeast of Bickmore in Henry and Pleasant District of Clay County.

The 2010 303D List list Leatherwood Creek and Right Fork of Leatherwood Creek as impaired for iron, selenium AQ. The Draft 2012 303D List list Cannel Coal Hollow as impaired for selenium. The Elk River has an approved TMDL (2012) for iron, aluminum, pH and selenium. This operation discharges into SUBID 20436, 20437, and 20438. The iron allocation is 1.5 mg/L for all three SUBID's. Selenium allocations' for SUBID 20436 is 11.0 ug/L for on bench discharges and 5.0 ug/L for in stream discharges. The selenium allocation is 5.0 ug/L for both on bench and in steam discharges for SUBID's 20437 and 20438. None of the receiving streams are trout streams.
This reissuance includes a compliance schedule for selenium at outlets 022, 023, and 027 with interim and final effluent limits.

Effluent Limits

This permit is subject to new source performance standards (NSPS) 40CFR434.35. As such, pH and total suspended solids (TSS) are in accordance with NSPS. The water quality effluent limitations assigned for iron, manganese, and aluminum are as or more stringent than would be required by NSPS ELGs. The proposed site is located well outside of the 5-mile zone upstream of a known water supply, therefore manganese human health criterion does not apply. Manganese was assigned tech based limits at all outlets due to the operation being outside 5 miles of a public water intake. Those limits will be retained in this reissuance. The TMDL has an iron allocation of 1.5 mg/L for all of the SUBID's that this permit discharges into. Anti-degradation reviews done in modifications number 12 and 14 set iron effluent limits lower than 1.5 mg/L for all outlets except 028. Outlet 028 iron effluent limit has been lowered from tech based to the TMDL allocation of 1.5 mg/L. The TMDL has no allocations for aluminum in SUBID's 20436, 20437, and 20438. Aluminum effluent limits were assigned water quality criteria end of pipe limits for outlets 020-025, 027 and 028 in the last reissuance. Outlets 026, 029-031 were assigned in an anti-degradation review in modification no. 14 . Those limits will be retained in this reissuance. The TMDL has selenium

allocations of 5 ug/L for both in stream outlets and on bench outlets in SUBID 20437 outlet 022 and SUBID 20438 outlet 023. SUBID 20436 outlets 020, 021, 024, 025-031 has selenium allocations of 11.0 ug/L for on bench outlets and 5.0 ug/L for in stream outlets. Outlets 020, 021, 024-026, and 028-031 are on bench outlets that discharge into SUBID 20436 and have been assigned an allocation of 11.0 ug/L. Outlets 022, 023, and 027 are in stream outlets and have been assigned an allocation of 5.0 ug/L. All outlets and stream stations have specific conductance, total sulfates and total dissolved solids added as report only. All stream stations and in stream outlets will also have hardness added.

Effluent limits outlets 020, 021, 024, 025:

Flow	Report Only
pH	6 s.u. minimum 9 s.u. maximum
Sulfates	Report Only
Specific Conductance	Report Only
TDS	Report Only
SS	0.5 ml/L maximum
TSS	35 mg/L monthly average - 70 mg/L daily maximum
T. Se	10.4 ug/L monthly average - 18.1 ug/L daily maximum
T. Fe	0.35 mg/L monthly average - 0.61 mg/L daily maximum
T. Mn	2.0 mg/L monthly average - 3.47 mg/L daily maximum
T. Al	0.43 mg/L monthly average - 0.75 mg/l daily maximum
d. Al	Report Only

Effluent limits outlets 022, 023, 027:

Flow	Report Only
pH	6 s.u. minimum 9 s.u. maximum
Sulfates	Report Only
Specific Conductance	Report Only
Hardness	Report Only
TDS	Report Only
SS	0.5 ml/L maximum
TSS	35 mg/L monthly average - 70 mg/L daily maximum
T. Se	4.7 ug/L monthly average - 8.2 ug/L daily maximum
T. Fe	0.35 mg/L monthly average - 0.61 mg/L daily maximum
T. Mn	2.0 mg/L monthly average - 3.47 mg/L daily maximum
T. Al	0.43 mg/L monthly average - 0.75 mg/l daily maximum
d. Al	Report Only

Effluent limits outlets 028:

Flow	Report Only
pH	6 s.u. minimum 9 s.u. maximum
Sulfates	Report Only
Specific Conductance	Report Only
TDS	Report Only
SS	0.5 ml/L maximum
TSS	35 mg/L monthly average - 70 mg/L daily maximum
T. Se	10.4 ug/L monthly average - 18.1 ug/L daily maximum
T. Fe	1.42 mg/L monthly average - 2.46 mg/L daily maximum
T. Mn	2.0 mg/L monthly average - 3.47 mg/L daily maximum
T. Al	0.43 mg/L monthly average - 0.75 mg/l daily maximum
d. Al	Report Only

Effluent limits outlets 026, 029,030, 031:

Flow	Report Only
pH	6 s.u. minimum 9 s.u. maximum
Sulfates	Report Only
Specific Conductance	Report Only
TDS	Report Only
SS	0.5 ml/L maximum
TSS	35 mg/L monthly average - 70 mg/L daily maximum
T. Se	10.4 ug/L monthly average - 18.1 ug/L daily maximum
T. Fe	1.04 mg/L monthly average - 1.81 mg/L daily maximum
T. Mn	2.0 mg/L monthly average - 3.47 mg/L daily maximum
T. Al	0.31 mg/L monthly average - 0.55 mg/l daily maximum
d. Al	Report Only

Selenium/POC

Selenium effluent limits are being added to this permit due to high concentrations in table 2-IV-A,B,C and TMDL allocations for this permit. Analysis of other pollutants on table 2-IV-A,B,C show no results higher than water quality criteria, therefore no additional parameters of concern were identified.

Narrative Water Quality Standards

Narrative Water Quality Standard - According to the WVDEP's "Permitting Guidance for Surface Coal Mining Operation to Protect West Virginias' Narrative Water Quality Standards, 47 CSR 2, Section 3.2.e and 3.2.i issued August 12, 2010 and revised May 11, 2012", if an outlet is primarily precipitation induced, the guidance does not apply. Facilities with primarily precipitation induced discharges are unlikely to cause or contribute to violations of the West Virginia's narrative water quality standards. Precipitation induced discharges (storm water) flow only in response to precipitation and do not have residence time with un-weathered rock and therefore would not be expected to have elevated mineralization/ions in the discharge. Primarily precipitation induced outlets only flow at times when the receiving streams have the greatest assimilative capacity (dilution). These outlets are designed to not discharge during critical low flow conditions of the receiving stream, and therefore do not have a reasonable potential to adversely impact the aquatic ecosystem. Outlets 021, 024, 028, 029, 030 and 031 are on bench outlets that are not constructed. However, the drainage areas contributing to them are small and the outlet locations are outside of jurisdictional waters. It is expected that they would be precipitation induced. Outlet 26 is constructed and located outside of jurisdictional waters. As demonstrated by DMR data, this outlet is precipitation induced. Outlet 026 has not flowed in the past year. Sediment ditches associated with these outlets are large and would be expected to hold usual storm events as is demonstrated by 026. There are 3 outlets associated with ponds on this permit, Outlet 022 with pond 1; Outlet 023 with pond 8 and Outlet 027 with pond 23. These ponds are constructed and certified and considered "in-stream" ponds. DMR data reflects that these three outlets exhibit continual flow throughout the year and would be considered non precipitation induced. Outlets 020 & 025 are on bench outlets and are located outside of jurisdictional waters. However, these two outlets have ground water contributions from seeps. DMR data reflects that these outlets do not flow, but that lack of flow is related to operational management of the water for treatment. Outlets 020, 022, 023, 025, 027 have been constructed and certified and the contributing drainage areas are reclaimed, totally vegetated and have trees planted in the drainage shed. Mining was completed in February of 2012 with final coal hauled from site in June of 2012. Elimination of all high wall, backfilling and grading was completed in April of 2013. All reclamation activities are completed, including tree planting on the associated areas. There are no operations being done on this permit other than reclamation and water monitoring. Current control measures on-site include established vegetation, established drainage control system, with on-going inspections, maintenance and monitoring. As verified by the Inspector, these outlets would be considered substantially complete. The term 'substantially complete' shall mean that the operation is past the point when measures that could be undertaken under either an AEPP (Aquatic Ecosystem Protection Plan) or AMP (Adaptive Management Plan) could be effective in reducing the operation's impact on the aquatic ecosystem and guidance not applicable.

Special Effluent Characterization

A special condition has been added to this permit and is contained in Section D, 6 of this permit.The permittee must perform Table 2-IV-A,B,C analyses within two (2) years of commencement of a new discharge. The permittee is also requires to identify and analyze any potential pollutants not covered under 2-IV-A,B,C analyses which may be present due to use manufacturing or byproduct. Representive outlets are acceptable for discharges which receive drainage from similar mining activities and are of the same outlet type. Two (2) copies of the Table 2-IV-A,B,C analyses and any additional potential pollutants analyses must be submitted to the regional office Permit Supervisor and Inspector Supervisor within two (2) years of commencement of discharge.

Special Sampling Condition

A special sampling condition has been added to this permit and is contained in Section D, 7 of this permit. This Special sampling condition is being added to the permit to verify the presumption that discharges from on-bench outlets which flow only in response to precipitation would not be expected to have reasonable potential to cause or contribute to a violation of the narrative water quality standards. The sampling is also intended to document relationship between discharges from on-bench outlets (precip-induced) and stream quality and to verify that discharges from these outlets only flow when streams have the greatest assimilative capacity. Sample site criteria are being specified to direct sampling to the outlet(s) which are most likely to discharge during any given sampling event in response to precipitation.

Reopener Clause

A reopener clause has been added to this permit and is contained in Section D, 8 of this permit

4. Types of effluent limitations:

Technology Based Outlets (0):

Water Quality Based Outlets (12): 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031

Best Professional Judgement Based Outlets (0):

Special Outlets (0):

Ammonia Outlets (0):

Sewage Outlets (0):

Additional Comments: /additional_comments/

5. Special Conditions or other monitoring requirements:

Stream Monitoring: DCCH (P-9), DLC (P-12), DRFLC (P-10), DRFLC (P-11)

Groundwater Monitoring:

6. Does the application contain:

Valley fills/refuse?	N/A
In Ephemeral Streams?	N/A
In Intermittent/Perennial Streams?	N/A

PUBLIC JUSTICE

March 29, 2016

Gina McCarthy
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. N.W.
Washington, D.C. 20460

Shawn Garvin
Region III Administrator
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Re: 60-Day Notice of Intent to File a Citizen Suit for EPA's Failure to Perform Its Non-Discretionary Duty under Section 303(c) of the Clean Water Act

Dear Administrator McCarthy and Regional Administrator Garvin:

The Sierra Club, West Virginia Highlands Conservancy, and Ohio Valley Environmental Coalition (collectively "Citizen Groups"), in accordance with Section 505 of the Clean Water Act ("CWA"), 33 U.S.C. § 1365 and 40 C.F.R. Part 135, hereby notify the U.S. Environmental Protection Agency ("EPA") that it has failed to perform its nondiscretionary duty pursuant to Section 303(c) of the CWA. If EPA does not remedy this failure within the next sixty days, the Citizen Groups intend to file a citizen suit to enforce that duty.

The CWA authorizes a citizen to bring a suit against the EPA "where there is alleged a failure of the Administrator to perform any act or duty under this chapter which is not discretionary." 33 U.S.C. § 1365(a)(2). The EPA has a nondiscretionary duty under § 303(c) of the CWA to review all new and revised water quality standards within a set time. "Whenever the State revises or adopts a new [water quality] standard, such revised or new standard shall be submitted to the Administrator," and the Administrator must approve the standard "within sixty days after the date of submission of the revised or new standard." 33 U.S.C. §§ 1313(c)(2)(A), (c)(3). If, instead, the Administrator finds the standard inconsistent with the Act, "he shall not later than the ninetieth day after the date of submission of such standard notify the State and specify the changes to meet such requirements." *Id.*, § 1313(c)(3).

As we explain below, West Virginia has revised its narrative water quality standard for biological integrity to make it inapplicable to discharges from "substantially complete" outlets at coal mines in the state. West Virginia has never submitted that revision to EPA for approval, yet is applying it as a permitting protocol for NPDES mining permits. EPA therefore has a nondiscretionary duty under § 303(c) to review and to approve or disapprove that revision.

publicjustice.net

National Headquarters
1620 L Street NW, Suite 630, Washington DC 20036
(202) 797-8600 phone • (202) 232-7203 fax

West Coast Office
555 12th Street, Suite 1230, Oakland CA 94607
(510) 622-8150 phone • (510) 622-8155 fax

WVDEP's federally-enforceable narrative water quality standards prohibit permittees from causing, or materially contributing to, conditions in which there are "[m]aterials in concentrations which are harmful . . . to . . . aquatic life" or conditions that result in "significant adverse impacts to the chemical . . . or biological components of aquatic ecosystems." 47 C.S.R. §§ 2-3.2.e & 2-3.2.i. West Virginia's biennial list of impaired streams under § 303(d) of the CWA includes scores of streams that violate this prohibition against biological impairment. That impairment is caused, in large part, by the ionic pollution – in the form of dissolved salts measured as conductivity – that is discharged from coal mine valley fills.

In 2011, EPA finalized a guidance document (approved by its Scientific Advisory Board) identifying ionic pollution from coal mines as a major source of harm to aquatic life in streams across Central Appalachia, and recommending a benchmark limit for conductivity. EPA, A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams (2011). EPA's Benchmark establishes that when instream conductivity exceeds a level of 300 microSiemens per centimeter (μS/cm), there is a 59 percent likelihood of biological impairment in violation of the narrative water quality standard, and at 500 μS/cm, there is a 72 percent likelihood of biological impairment. Benchmark at A-36. The level of conductivity in discharges from outlets below valley fills is often in the range of 2,000 to 4,000 μS/cm.

In three recent CWA citizen suits, a West Virginia federal court has held that the discharges of high levels of ionic chemicals from five mines have caused biological impairment of five streams in violation of West Virginia's narrative water quality standards. *OVEC v. Elk Run Coal Co.,* 24 F. Supp. 3d 532 (S.D.W.Va. 2014); *OVEC v. Fola Coal Co.,* 82 F. Supp. 3d 673 (S.D.W.Va. 2015); *OVEC v. Fola Coal Co.,* 120 F. Supp. 3d 509 (S.D.W.Va. 2015). In each case, the court applied the same standard of impairment (a West Virginia Stream Condition Index Score below 68) that EPA used in 2013 to restore streams to West Virginia's 303(d) list. 24 F. Supp. 3d at 556; 82 F. Supp. 3d at 679-81; 120 F. Supp. 3d at 539, 542. In addition, in each case, the court deferred to EPA and applied EPA's Benchmark levels for protecting stream life from harmful levels of conductivity. 24 F. Supp. 3d at 559; 82 F. Supp. 3d at 684; 120 F. Supp. 3d at 518.

Rather than follow EPA's Benchmark, WVDEP has issued its own permitting protocol to address the scope of protection afforded by West Virginia's narrative standards. "Permitting Guidance for Surface Coal Mining Operations to Protect West Virginia's Narrative Water Quality Standards" ("Permitting Guidance") (attached). That guidance was first issued on August 12, 2010 and was revised on May 11, 2012. WVDEP determined that the way to ensure that discharges do not violate the State's narrative water quality standards is to "identif[y] specific pollutants that can be managed through the inclusion of appropriate whole effluent toxicity ("WET") monitoring and/or limits and best management practices ("BMPs") in NPDES permits, where there is reasonable potential to cause or contribute to excursions from water quality criteria." Permitting Guidance at 2. If the permit applicant cannot demonstrate through chemical and biological monitoring and control measures that it does not have reasonable potential to cause or contribute to an excursion above the narrative criteria, WVDEP has instructed the permit writer to include WET limits in the permit. *Id.* at 1. Thus, even though WVDEP has not fol-

lowed EPA's Benchmark, it has found that, at a minimum, the application of WET limits is necessary to protect West Virginia's narrative water quality standard for biological integrity.

However, WVDEP's Permitting Guidance, and its requirement to include WET limits in permits, "does not apply to outlets that are primarily precipitation induced, or for which the activities associated with those outlets have been substantially completed," which is defined to mean "that the operation is past the point when measures that could be undertaken under either an AEPP [Aquatic Ecosystem Protection Plan] or an AMP [Adaptive Management Plan] could be effective in reducing the operation's impact on the aquatic ecosystem." *Id.* at 1 & n.3. For example, WVDEP has applied this exemption to Fola Coal Company, LLC's NPDES Permit No. WV1014005 for its Surface Mine No. 3. On January 20, 2015, WVDEP reissued that permit but refused to apply WET limits to Outlets 024, 027, 029 and 035 at that mine because they were "substantially complete." WVDEP has also applied the same exemption to Fola Coal Company, LLC's NPDES Permit No. WV1018001 for its Surface Mine No. 6. On April 20, 2015, WVDEP refused to apply WET limits to Outlets 013, 015 and 017 because the valley fills and mineral removal activities at that mine were complete and "[t]he areas behind each outlet are past the point where additional control measures could be implemented to reduce the impact on the aquatic ecosystem." Rationale Page, pp. 6-7. As a result, WVDEP has exempted Fola, and other mining permittees with "substantially complete" outlets, from the narrative water quality standard for biological integrity. Those outlets are not subject to a reasonable potential analysis under 40 C.F.R. § 122.44(d), and will not be assigned WET limits, even if there is in fact a reasonable potential, or even a certainty, that they are causing a violation of narrative water quality standards.

WVDEP's exemption policy is directly affecting and harming Citizen Groups' members. Citizen Groups' members use Twentymile Creek downstream from Fola's Outlets 024 and 029 for recreational activities. Citizen Groups have successfully sued Fola for discharging high conductivity from Outlets 024 and 029 at its Surface Mine No. 3 and Outlets 013, 015 and 017 at its Surface Mine No. 6 in violation of the narrative standard for biological integrity. Outlet 029 (which discharges into Stillhouse Branch) and Outlets 013, 015, and 017 (which discharge into Cogar Hollow) were all adjudicated to be in violation of that standard. Outlet 029 is subject to an injunction requiring compliance. *OVEC v. Fola Coal Co.,LLC,* 82 F. Supp. 3d at 697-98; December 8, 2015 Order Specifying Relief, Docket No. 183. Outlet 024 (which discharges into Boardtree Branch) is subject to a federal consent decree requiring Fola to comply with WET limits and a passing WVSCI score for biological integrity. *Sierra Club v. Fola Coal Co., LLC,* Civil No. 2:10-1199 (S.D.W.Va), Docket No. 66, February 12, 2012 Consent Decree at 9, para. 38. A trial on relief for the other three outlets at Surface Mine No. 6 will be held in May 2016. Consequently, even though these five outlets are in fact causing violations of narrative standards, and therefore should, at a minimum, be subject to WET limits, the current NPDES permits for those outlets do not require WET limits because WVDEP's Permitting Guidance has exempted them from WET compliance.

To attempt to remedy its non-compliant discharges into Boardtree Branch and Stillhouse Creek, Fola is proposing to divert the underdrain water from its valley fills away from those impaired tributaries and to pipe this water directly into Twentymile Creek. The underdrain water, which has infiltrated through the valley fills, has higher conductivity than the surface runoff. By separating and diverting the higher contributing source of conductivity, Fola hopes that the lower conductivity surface runoff will result in compliance with the

narrative standard. But, according to Fola's own engineering expert, Al Meek, the level of conductivity in the diverted water piped into Twentymile Creek could be 3600 μS/cm or higher—twelve times higher than the EPA Benchmark of 300 μS/cm. Fola's past WET tests for its discharges into Boardtree Branch have consistently failed the chronic toxicity standard of 1.0 chronic toxicity units (TUc) (using non-native species like *C. dubia*) when the conductivity exceeds 3000 μS/cm, as shown in the following table:[1]

Initial Date of sampling	TUc	Conductivity (μS/cm)	Sulfate (mg/L)
7/10/2012	2	3410	1690
9/24/2012	2	3220	2090
10/28/2013	4	2750-3720	1700-2480
5/5/2014	2	3410-3430	1920-2060
5/5/2014	4	3290-3340	1940-2010
11/5/2014	2	3181-3343	1727-1932
11/5/2014	2	3068-3240	1717-1828
11/5/2014	2	3270-3410	2060-2460
11/5/2014	4	3130-3290	1960-2270
11/5/2014	2	3200-3370	2100-2500
11/5/2014	2	3100-3300	2100-2400
2/24/2015	<1	2633-2726	1108-1685
3/30/2015	<1	2907-2943	1703-1948
3/30/2015	<1	2625-2832	1632-1740
3/30/2015	<1	2576-2831	1638-1719

If EPA approved the use of WET tests using native mayfly species, the WET test failure would occur at much lower levels of conductivity. Kunz found that Boardtree water was toxic to a native mayfly species at 800 to 1300 μS/cm. Kunz et al., Use of Reconstituted Waters to Evaluate Effects of Elevated Major Ions Associated with Mountaintop Coal Mining on Freshwater Invertebrates, Environ. Tox. & Chem. 32(12): 2826-35 (2013), at 2834. Consequently, the likely net result of Fola's attempted corrective action would be to transfer the most polluted water from the smaller tributaries (Boardtree Branch and Stillhouse Creek) to a larger one (Twentymile Creek) without any treatment or pollution reduction, and to cause a violation of the narrative standard for aquatic toxicity in Twentymile Creek.

Fola will need WVDEP's approval of a major modification of its NPDES permit to discharge from the new diversion pipes. But WVDEP will likely determine that, under

[1] Source: Fola Coal Company, LLC's Analysis of the Chemical, Biological, and Toxicological Monitoring Data Collected at Boardtree Branch, Appendix C, dated October 20, 2015.

its Permitting Guidance, those outlets are "substantially complete" because mining at Fola's Surface Mine No. 3 has been completed. If so, then the new pipe outlets would not be subject to any WET limits. Thus, the Permitting Guidance would exempt violations of the narrative standards in Twentymile Creek.

Although WVDEP's policy is expressed as "guidance," it is in full force as binding state law. The relevant West Virginia statute provides that "all authority to promulgate and implement water quality standards is vested in [WVDEP]." W. Va. Code § 22-11-7b(a). In its December 28, 2012 reply brief in *Clarke v. Sierra Club*, Civil No. 12-AA-102 (Cir. Ct., Kanawha Cty), WVDEP stated that "[t]he Permitting Guidance represents WVDEP's *implementation* of the biological component of the State's narrative water quality standards." Reply Brief at 4 (emphasis in original). WVDEP further stated that "[p]ursuant to the Legislature's 2005 amendment to § 22-11-7b(a), only WVDEP, and not the [Environmental Quality Board], possesses such implementation authority." *Id.* Thus, WVDEP regards its Permitting Guidance as binding state law, and is applying it to existing NPDES mining permits in a way that has immediate and direct effects. EPA has stated that "policies generally affecting the[] application and implementation" of water quality standards "are subject to EPA review and approval." 40 C.F.R. § 131.13.

WVDEP's exemption of NPDES mining permits with "substantially complete" outlets from West Virginia's narrative water quality standards for biological integrity is a revision to, and weakening of, those standards. That revision has been in effect as state law since August 2010, triggering EPA's nondiscretionary duty to review and approve or disapprove it. By failing to do so, EPA has violated its nondiscretionary duty under § 303(c).

If EPA exercises that duty, it should disapprove WVDEP's "substantially complete" exemption policy. It is simply not true that mining companies can do nothing to control conductivity after mining is complete. EPA's 2011 consent decree with Consol Energy (Fola's parent) required it to install a reverse osmosis treatment plant that can eliminate 99% of the ionic pollution from its discharges from a mine into Dunkard Creek in West Virginia. EPA Information Sheet, Consol Energy Clean Water Act Settlement, available at: http://www.epa.gov/enforcement/consol-energy-clean-water-act-settlement; *United States v. Consol Energy*, Civil No. 1:11-cv-00028 (N.D. W.Va.). In any event, when it comes to achieving water quality standards, "economic and technological restraints are not a valid consideration" in crafting NPDES permits. *Ackels v. EPA*, 7 F.3d 862, 865-66 (9th Cir. 1993). The permit issuing agency "is under a specific obligation to require that level of effluent control which is needed to implement existing water quality standards without regard to the limits of practicability." *Defenders of Wildlife v. Browner*, 191 F.3d 1159, 1163, *amended on other grds.*, 197 F.3d 1035 (9th Cir. 1999). Technological infeasibility and the cost or difficulty of achieving compliance are not defenses to a CWA violation. *U.S. v. CPS Chem. Co., Inc.*, 779 F. Supp. 437, 453 (E.D. Ark. 1991); *U.S. v. City of Hoboken,* 675 F. Supp. 189, 197-98 (D.N.J. 1987); *OVEC v. Apogee Coal Co., LLC,* 555 F. Supp. 2d 640, 649 (S.D.W.Va. 2008). WVDEP's policy therefore violates the CWA and cannot be approved.

If EPA continues to fail to perform its nondiscretionary duty after sixty (60) days from the postmark of this letter, the Citizen Groups intend to file a citizen's suit under section 505(a)(2) of the CWA to compel EPA to perform its nondiscretionary duty. The Citizen

Groups would, however, be happy to meet with EPA to attempt to resolve the issue within the 60-day notice period. Please do not hesitate to contact us.

Sincerely,

J. Michael Becher
Appalachian Mountain Advocates
PO Box 507
Lewisburg, WV 24901
(304) 382-4798
mbecher@appalmad.org

James M. Hecker
Public Justice
1620 L Street NW, Suite 630
Washington, DC 20036
(202) 797-8600 ext. 225
jhecker@publicjustice.net

On behalf of

The Sierra Club
85 Second Street, 2d Floor
San Francisco, CA 94105
(415) 977-5680

Ohio Valley Environmental Coalition
P.O. Box 6753
Huntington, WV 25773
(304) 522-4079

West Virginia Highlands Conservancy
P.O Box 306
Charleston, WV 25321
(304) 924-5802

cc:

Randy Huffman
WVDEP
601 57th Street S.E.
Charleston, WV 25304

Loretta Lynch
U.S. Attorney General
U.S. Department of Justice
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001

Environmental Impact Statement
for the Stream Protection Rule
Draft () Final (x)

Lead Agency:	U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE)
Cooperating Agencies:	**Federal Agencies:** U.S. Environmental Protection Agency U.S. Fish and Wildlife Service **State SMCRA Regulatory Authorities:** Wyoming Department of Environmental Quality **State Historic Preservation Offices:** Virginia Department of Historic Resources **State Wildlife Agency:** West Virginia Department of Natural Resources
Contact Information:	Correspondence on this Final Environmental Impact Statement (FEIS) should be directed to: Ms. Robin T. Ferguson Office of Surface Mining Reclamation and Enforcement U.S. Department of Interior 1951 Constitution Avenue, N.W. Washington, D.C. 20240 Telephone: 202-208-2802 rferguson@osmre.gov

Abstract

The Office of Surface Mining Reclamation and Enforcement (OSMRE) has prepared a final Environmental Impact Statement (FEIS) on proposed revisions to regulations (at 30 CFR Chapter VII) for implementation of the Surface Mining Control and Reclamation Act (SMCRA or the Act) of 1977. The proposed revisions would better protect streams, fish, wildlife, and related environmental values from the adverse impacts of surface coal mining operations and provide mine operators with a regulatory framework to avoid water pollution and the long-term costs associated with water treatment, more completely implement the requirements of SMCRA, remedy deficiencies in existing rules, and remove obsolete or unneeded provisions from existing rules. The FEIS analyzes the proposed revisions in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended, 42 U.S.C. 4321-4347; the Council on Environmental Quality's (CEQ's) regulations for implementing NEPA, 40 CFR Parts 1500 through 1508; and the U.S. Department of the Interior's NEPA regulations, 43 CFR Part 46.

The proposed action is intended to balance all relevant purposes of the Act, as listed in Section 102 of SMCRA, 30 U.S.C. § 1202. Those purposes include ensuring that surface coal mining operations are conducted in a manner that protects the environment, establishing a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations, and ensuring a coal supply adequate for our Nation's energy needs.

U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

FINAL

November 2016

Stream Protection Rule

Environmental Impact Statement

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APPENDICES:

Executive Summary

ES.1 Background and Overview

The Office of Surface Mining Reclamation and Enforcement (OSMRE) has prepared this Final Environmental Impact Statement (FEIS) on proposed revisions to regulations (at 30 CFR Chapter VII) for implementation of the Surface Mining Control and Reclamation Act (SMCRA or the Act) of 1977. The proposed revisions would better protect streams, fish, wildlife, and related environmental values from the adverse impacts of surface coal mining operations and provide mine operators with a regulatory framework to avoid water pollution and the long-term costs associated with water treatment, more completely implement the requirements of SMCRA, remedy deficiencies in existing rules, and remove obsolete or unneeded provisions from existing rules. The FEIS analyzes the proposed revisions in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended, 42 U.S.C. 4321-4347; the Council on Environmental Quality's (CEQ's) regulations for implementing NEPA, 40 CFR Parts 1500 through 1508; and the U.S. Department of the Interior's NEPA regulations, 43 CFR Part 46.

Scientific studies published since the adoption in 1983 of our principal regulations have indicated that surface coal mining operations continue to have significant negative impacts on streams, fish, and wildlife despite the enactment of SMCRA and the federal regulations implementing that law. The principal purpose of the current proposed action is to update and revise the regulations to reflect the best available science in order to avoid or minimize these negative impacts, and provide regulatory certainty to industry.

The FEIS analyzes the impacts of implementing rule changes that would do the following:

- Define the term "material damage to the hydrologic balance outside the permit area" and require that each permit establish the point at which adverse mining-related impacts on groundwater and surface water reach an unacceptable level; i.e., the point at which adverse impacts from mining would cause material damage to the hydrologic balance outside the permit area.
- Set forth how to collect adequate premining data about the site of the proposed mining operation and adjacent areas to establish a comprehensive baseline that will facilitate evaluation of the effects of mining operations.
- Set forth how to conduct effective, comprehensive monitoring of groundwater and surface water during and after both mining and reclamation and during the revegetation responsibility period to provide real-time information documenting mining-related changes in water quality and quantity.
- Address the need for required monitoring of the biological condition of streams during and after mining and reclamation to evaluate changes in aquatic life. Proper monitoring would enable timely detection of any adverse trends and allow timely implementation of any necessary corrective measures.

- Promote the protection or restoration of perennial and intermittent streams and related resources, especially the headwater streams that are critical to maintaining the ecological health and productivity of downstream waters.
- Ensure that permittees and regulatory authorities make use of advances in information, technology, science, and methodologies related to surface and groundwater hydrology, surface-runoff management, stream restoration, soils, and revegetation, all of which relate directly or indirectly to protection of water resources.
- Ensure that land disturbed by surface coal mining operations is restored to a condition capable of supporting the uses that it was capable of supporting before mining. Soil characteristics and the degree and type of revegetation have a significant impact on surface-water runoff quantity and quality as well as on aquatic life and the terrestrial ecosystems dependent upon perennial and intermittent streams.
- Update and codify requirements and procedures to protect threatened and endangered species and designated critical habitat under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq), and better explain how the fish and wildlife protection and enhancement provisions of SMCRA should be implemented.

As with the existing regulations, implementation of the revised regulations would be the responsibility of the applicable regulatory authority. OSMRE is headquartered in Washington, D.C. and is the regulatory authority in the states of Tennessee and Washington, and on Indian lands. All other coal-producing states have received approval of their proposed regulatory programs and thus function as the regulatory authorities in their respective states. OSMRE has oversight responsibility of the states' implementation of their OSMRE-approved regulatory programs. When a state or Indian tribe submits and receives approval of its proposed regulatory program from us, it becomes the primary regulator within that state or on reservation lands, respectively, and assumes responsibility over permitting, inspection, and enforcement activities. OSMRE then provides oversight of the state's or tribe's implementation of the regulatory program, technical assistance and support.

The proposed action would also help fulfill OSMRE's responsibilities under a Memorandum of Understanding (MOU) that the Secretary of the Department of the Interior, the Administrator of the U.S. Environmental Protection Agency (EPA), and the Acting Assistant Secretary of the Army (Civil Works) entered into on June 11, 2009. This MOU, referred to in this FEIS as the CWA MOU from this point forward, implemented an interagency action plan designed to significantly reduce the harmful environmental consequences of surface coal mining operations in six Appalachian states, while ensuring that future mining remains consistent with federal law. Specifically, Part III.A of the CWA MOU provides that the parties to the CWA MOU will review "existing regulatory authorities and procedures to determine whether regulatory modifications should be proposed to better protect the environment and public health from the impacts of Appalachian surface coal mining." It also provides that, at a minimum, revisions will be considered to the Stream Buffer Zone (SBZ) Rule published December 12, 2008 and the regulatory requirements concerning approximate original contour.

Finally, the proposed action is intended to balance all relevant purposes of the Act, as listed in Section 102 of SMCRA, 30 U.S.C. § 1202. Those purposes include ensuring that surface coal mining operations are conducted in a manner that protects the environment, establishing a nationwide program to protect

society and the environment from the adverse effects of surface coal mining operations, and ensuring a coal supply adequate for our Nation's energy needs.

ES.2 Public Involvement

On November 30, 2009, OSMRE published an Advance Notice of Proposed Rulemaking (ANPR) soliciting comments on ten potential rulemaking Alternatives. Approximately 32,750 comments were received during the 30-day comment period on various issues related to stream protection. After evaluating the comments, it was determined that development of a comprehensive Stream Protection Rule (SPR) (one that is much broader in scope than OSMRE's 2008 SBZ rule) would be the most appropriate and effective method of achieving the goals set forth in the CWA MOU and the ANPR. OSMRE published a notice of intent (NOI) to prepare an EIS in the *Federal Register* on April 30, 2010 (75 FR 22723) followed by an additional notice on June 18, 2010 (75 FR 34666). The additional notice informed the public of scoping opportunities to include open houses and to outline possible Alternatives that were being considered. Approximately 400 people attended the open houses and provided almost 450 written and oral comments. In addition, 20,126 comments were received through the mail and website. The scoping period closed July 30, 2010.

Most comments were specific to the elements of the Proposed Rule and possible Alternatives set out in the June 18, 2010 NOI. Some commenters recommended clarifications to existing rules as opposed to a new rulemaking, made suggestions pertaining to specific elements or Alternatives within the Proposed Rulemaking, or raised new issues or rule elements for consideration.

Comments were generally divided into two categories: (1) comments in support of rule revisions that would provide greater environmental protection for streams and other natural resources; and (2) comments that support the adequacy of the existing regulations. Some commenters favoring greater environmental protections advocated interpretation of the 1983 Stream Buffer Zone Rule as an absolute prohibition on stream impacts. This group of comments described the 1983 rules as a bright-line prohibition against any adverse impacts within the stream buffer zone, although the courts have not always agreed with this interpretation by the commenters as explained below in the scope section. Other comments suggested that this FEIS assess the effects of an Alternative that would ban surface mining of coal in or near streams.

Comments that opposed changes to current rules asserted that additional regulation would impair mining operations, increase costs, endanger jobs at a time of high unemployment, and provide little, if any, additional protection for the environment. Some comments questioned OSMRE's authority under SMCRA to adopt certain measures under consideration. Others asserted that OSMRE had failed to articulate a need for new regulations so soon after adopting the 2008 Stream Buffer Zone Rule.

Some comments from the coal-producing regions of the Midwest and the West also questioned the need to promulgate a nationwide Stream Protection Rule, arguing that there is no evidence of adverse impacts on streams outside of Appalachia. These comments also argued that because of regional differences, many elements under consideration would be inapplicable, cumbersome, costly, or impractical to apply outside Appalachia.

On July 16, 2015, OSMRE announced that the Proposed Rule, Draft EIS (DEIS), and Draft Regulatory Impact Analysis (RIA) were available for review at www.regulations.gov, on our website (www.osmre.gov), and at selected OSMRE offices. On July 17, 2015, OSMRE published a notice in the Federal Register announcing the availability of the DEIS for the Proposed Rule. See 80 FR 42535-42536. The notice reiterated that the DEIS was available for review at www.regulations.gov, www.osmre.gov, and the OSMRE offices listed in the notice. The comment period for the DEIS was originally scheduled to close on September 15, 2015. On July 27, 2015, OSMRE also published the Proposed Stream Protection Rule in the Federal Register. See 80 FR 44436-44698. That document reiterated that the Proposed Rule, DEIS, and Draft RIA were available for review at www.regulations.gov, www.osmre.gov, and the OSMRE offices listed in the notice. The comment period for the Proposed Rule and Draft RIA was originally scheduled to close on September 25, 2015. In response to requests for additional time to review and prepare comments on all three documents, OSMRE extended the comment period for the Proposed Rule, DEIS, and Draft RIA through October 26, 2015. See 80 FR 54590-54591 (Sept. 10, 2015).

Interested parties, therefore, received a total of 102 days to review the Proposed Rule and supporting documents. During that time, OSMRE also held six public hearings in Colorado, Kentucky, Missouri, Pennsylvania, Virginia, and West Virginia. OSMRE received approximately 95,000 comments from all sources on the Proposed Rule, DEIS, and Draft RIA.

ES.3 Scope of the Proposed Stream Protection Rule

Historically, OSMRE and some state regulatory authorities applied the 1983 stream buffer zone rule in a manner that allowed the placement of excess spoil fills, refuse piles, slurry impoundments, and sedimentation ponds in intermittent and perennial streams within the permit area. However, as discussed at length in the preamble to a 2004 Proposed Rule (see 69 FR 1038-1042 (Jan. 7, 2004)), which OSMRE never finalized, there has been considerable controversy over the proper interpretation of both the Clean Water Act and our 1983 rules as they apply to the placement of fill material in or near perennial and intermittent streams.

One interpretation of the 1983 stream buffer zone rules appears in our annual oversight reports for West Virginia for 1999 and 2000, which state that the stream buffer zone rule does not apply to the footprint of a fill placed in a perennial or intermittent stream as part of a surface coal mining operation. On June 4, 1999, in West Virginia Highlands Conservancy v. Babbitt, Civ. No. 1:99CV01423 (D.D.C.), the plaintiffs challenged the validity of that interpretation, alleging that it constituted rulemaking in violation of the Administrative Procedure Act.

However, on August 9, 1999, OSMRE, the U.S. Army Corps of Engineers, EPA, and the West Virginia Division of Environmental Protection (WVDEP) signed a MOU in which all four agencies in effect agreed to an interpretation that allowed valley fills in intermittent or perennial streams to be approved only if the buffer zone findings were made for the filled stream segments. The MOU, referred to in this FEIS from this point forward as the WV MOU, also stated that the Clean Water Act Section 404(b)(1) Guidelines at 40 CFR part 230 contain requirements comparable to the findings required by the combination of OSMRE's 1983 stream buffer zone rule and the West Virginia stream buffer zone rule. Consequently, the WV MOU found that, "where a proposed fill is consistent with the requirements of the Section 404(b)(1) Guidelines and applicable requirements for Section 401 certification of compliance

with water quality standards, the fill would also satisfy the criteria for granting a stream buffer zone variance under SMCRA and WVDEP regulations."[1] As a result of the signing of the WV MOU, the court approved an unopposed motion to dismiss the case mentioned above[2] as moot in an order filed September 23, 1999.

In a lawsuit filed in the U.S. District Court for the Southern District of West Virginia in July 1998, plaintiffs asserted that the 1983 stream buffer zone rule should be interpreted to allow mining activities through a perennial or intermittent stream or within the buffer zone for a perennial or intermittent stream only if the activities are minor incursions.[3] They argued that the rule did not allow substantial segments of a perennial or intermittent stream to be buried underneath excess spoil fills or other mining-related structures.[4] On October 20, 1999, the district court ruled in favor of the plaintiffs on this point, holding that the West Virginia version of the stream buffer zone rule applies to all segments of a stream, including those segments within the footprint of an excess spoil fill, not just to the stream as a whole.[5] The court stated that the construction of fills in perennial or intermittent streams is inconsistent with the language of the West Virginia counterpart to 30 CFR 816.57(a)(1), which provides that the regulatory authority may authorize surface mining activities within a stream buffer zone only after making certain findings, including a finding that the proposed activities would not "adversely affect the normal flow or gradient of the stream, adversely affect fish migration or related environmental values, materially damage the water quantity or quality of the stream…."[6] The court also concluded that, contrary to the August 1999 WV MOU, satisfaction of the Section 404(b)(1) Guidelines is not equivalent to satisfaction of the SMCRA buffer zone rule.[7]

On appeal, the U.S. Court of Appeals for the Fourth Circuit vacated the judgment of the district court and remanded the case with instructions to dismiss the counts concerning the stream buffer zone rule as barred by the Eleventh Amendment to the U.S. Constitution. See Bragg v. West Virginia Coal Ass'n, 248 F.3d 275, 296 (4th Cir. 2001), cert. denied, 534 U.S. 1113 (2002). While the Fourth Circuit did not interpret the 1983 version of the stream buffer zone rule, the brief for the federal appellants in that case included another interpretation of the regulation in their brief. In sum, the federal appellants supported an

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[1] Memorandum Of Understanding among the U.S. Office of Surface Mining, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and West Virginia Division Of Environmental Protection for the Purpose of Clarifying the Application of Regulations Related to Stream Buffer Zones under the Surface Mining Control and Reclamation Act for Surface Coal Mining Operations that Result in Valley Fills, August 9, 1999, p. 4.

[2] West Virginia Highlands Conservancy v. Babbitt, Civ. No. 1:99CV01423 (D.D.C.).

[3] See Bragg v. Robertson, 72 F. Supp. 2d 642, 660-663 (S.D. W. Va. 1999).

[4] Id.

[5] Id.

[6] Id. at 650-653, 661. In a related matter, a consent decree filed on January 3, 2000, and approved on February 17, 2000, stated that the West Virginia stream buffer zone rules only apply downstream from the toes of downstream faces of embankments of sediment control structures in perennial and intermittent streams. Bragg v. Robertson, 83 F. Supp. 2d 713, 718 n.4 (S.D. W. Va. 2000).

[7] Id. at 660.

interpretation based on the district court decision and stated that 30 CFR 816.57 "prohibits the burial of substantial portions of intermittent and perennial streams beneath excess mining spoil."[8]

In a different case related to the issuance of a nationwide section 404 permit under the Clean Water Act, the U.S. District Court for the Southern District of West Virginia stated in an opinion that SMCRA and the 1983 stream buffer zone rule do not authorize disposal of overburden in streams: "SMCRA contains no provision authorizing disposal of overburden waste in streams, a conclusion further supported by the buffer zone rule."[9] Yet, on appeal, the U.S. Court of Appeals for the Fourth Circuit rejected the district court's conclusion, stating that "SMCRA does not prohibit the discharge of surface coal mining excess spoil in waters of the United States."[10] The court further stated that "it is beyond dispute that SMCRA recognizes the possibility of placing excess spoil material in waters of the United States even though those materials do not have a beneficial purpose." [11]

In subsequent litigation, the federal appellants stated that "OSM[RE] has historically interpreted its 'stream buffer zone' rule . . . to allow for the construction of valley fills in intermittent and perennial streams, even if such fills cover a stream segment. The traditional interpretation of the [stream buffer zone] is in harmony with this Court's decision in Rivenburgh."[12] Additionally, the U.S. Court of Appeals for the Fourth Circuit has discussed SMCRA's role in the regulation of valley fills in the context of a challenge to individual permits under section 404 of the Clean Water Act.[13] See Ohio Valley Envtl. Coal. v. Aracoma Coal Co., 556 F.3d 177, 195 (4th Cir. 2009) ("Congress clearly contemplated that the regulation of the disposal of excess spoil and the creation of valley fills falls under the SMCRA rubric.").

By 2004, OSMRE had concluded that "[t]he issues and allegations raised indicate that there remains considerable misunderstanding regarding the meaning of the [1983 stream buffer zone] regulation . . . particularly as it applies to the placement of excess spoil fills within and near intermittent and perennial streams." *See* 69 Fed. Reg. 1,038-40. As a result it began a rulemaking effort to replace the 1983 SBZ rule, which resulted in adoption of a new stream buffer zone rule in 2008 (73 Fed. Reg. 75,818 (the 2008 rule)).

The 2008 SBZ rule was immediately challenged by 10 environmental groups in two lawsuits. In July 2013, the government moved for partial summary judgment on the grounds that it had failed to comply with the Endangered Species Act (ESA) when it adopted the rule. In the context of briefing that motion, the National Mining Association (NMA) recognized the confusion created by the 1983 SBZ rule:

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[8] Brief for Federal Appellants at 2, Bragg v. West Virginia Coal Ass'n, 248 F.3d 275 (4th Cir. 2001) (No. 99-2683) (footnote omitted).

[9] Kentuckians for the Commonwealth, Inc. v. Rivenburgh, 204 F. Supp. 2d 927, 942 (S.D. W. Va. 2002).

[10] Kentuckians for the Commonwealth, Inc. v. Rivenburgh, 317 F.3d 425, 442 (4th Cir. 2003).

[11] Id. at 443. The preamble to a Proposed Rule, which OSMRE published on January 7, 2004, but which OSMRE never adopted in final form, contains additional discussion of litigation and related matters arising from the 1983 stream buffer zone rule through 2003. See especially Part I.B.1. at 69 FR 1038-1040.

[12] Corrected Brief for Federal Appellants at 9 n.2, Ohio Valley Envtl. Coal. v. Bulen, 556 F.3d 177 (4th Cir. 2009) (Nos. 04-2129 (L), 04-2137, 04-2402) (footnote omitted).

[13] 33 U.S.C. 1344.

"Vacating the entire [2008 SBZ] Rule would undo the clarification it provides on non-ESA issues and return the regulatory program to its previous confused and uncertain state, which would remain in place for years to come until OSM[RE] issues a new notice of proposed rulemaking (currently promised for 2014) and, eventually, a new final rule." Brief of the Intervenor-Defendant at 32-33, *Nat'l Parks Conservation Ass'n v. Jewell*, 2014 U.S. Dist. LEXIS 152383 (D.D.C. Aug. 30, 2013) (No. 09-115). Despite NMA's protest, on February 20, 2014, the district court vacated the 2008 SBZ rule and reinstated the 1983 version. *Nat'l Parks Conservation Ass'n v. Jewell*, 2014 U.S. Dist. LEXIS 152383 at *31, *35 (D.D.C. Feb. 20, 2014)). The court in that case did not discuss any interpretation of the 1983 SBZ rule and instead focused on OSMRE's failure to comply with the Endangered Species Act.

Although the 2008 Stream Buffer Zone Rule that was in place when the 2009 ANPR was published has since been vacated (*NPCA v. Jewell*, No. 09-115, Memorandum Decision at 13-14 (D.D.C. Feb. 20, 2014)), and the prior rules have been reinstated, the conclusion that a comprehensive Stream Protection Rule is needed is still valid. Through the process of considering comments received on the Proposed Rulemaking and issues identified during scoping, it was determined that improved protection of the hydrologic balance, especially streams, fish, wildlife, and related environmental values is needed throughout the country. One of the reasons SMCRA was enacted was to ensure a minimum level of environmental protection nationwide by establishing national surface coal mining and reclamation standards to prevent competition for coal markets from undermining the ability of states to maintain adequate regulatory programs for coal mining operations within their borders. See Section 101(g) of SMCRA, 30 U.S.C. § 1201(g). Thus, OSMRE concluded that a nationwide rule is required.

Both the 2008 Stream Buffer Zone Rule and its predecessors focused primarily on activities in or within 100 feet of the stream itself and, in the case of the 2008 rule, on minimization of excess spoil creation and limiting the footprint of excess spoil fills. Yet, mining activities beyond the 100-foot stream buffer zone can have significant impacts on the quality and quantity of water in streams by disturbing aquifers and altering the physical and chemical nature of recharge zones, as well as surface-water runoff rates, drainage patterns, and fish, wildlife, and related environmental values.

Thus, there are many components of our regulations, not just the ones related to stream buffer zones, that could be revised to improve implementation of SMCRA with regard to stream protection and conservation of fish, wildlife, and related environmental values. In particular, six areas have been identified in which regulations to better protect streams and associated environmental values have been proposed.

First, there is a need to clearly define the point at which adverse mining-related impacts on both groundwater and surface water reach an unacceptable level; that is, the point at which adverse impacts from mining cause material damage to the hydrologic balance outside the permit area. Neither SMCRA nor the existing regulations define the term "material damage to the hydrologic balance outside the permit area" or establish criteria for determining what level of adverse impacts would constitute material damage. In particular, there is no requirement that the SMCRA regulatory authority establish a specific standard for conductivity or selenium, both of which can have deleterious effects on aquatic life at elevated levels.

Second, there is a need to collect adequate premining data about the site of the proposed mining operation and adjacent areas to establish a comprehensive baseline that will facilitate evaluation of the effects of mining. The existing rules require data only for a limited number of water-quality parameters rather than the full suite needed to establish a complete baseline against which the impacts of mining can be compared. The existing rules also contain no requirement for determining the biological condition of streams within the proposed permit and adjacent areas, so there is no assurance that the permit application will include baseline data on aquatic life.

Third, there is a need for effective, comprehensive monitoring of groundwater and surface water during and after both mining and reclamation and during the revegetation responsibility period to provide real-time information documenting mining-related changes in the values of the parameters being monitored. Similarly, there is a need to require monitoring of the biological condition of streams during and after mining and reclamation to evaluate changes in aquatic life. Proper monitoring will enable timely detection of any adverse trends and timely implementation of any necessary corrective measures. The existing rules require monitoring of only water quantity and a limited number of water-quality parameters, not all parameters necessary to evaluate the impact of mining and reclamation. The existing rules do not ensure that the number and location of monitoring points will be adequate to determine the impact of mining and reclamation. They also allow discontinuance or reduction of water monitoring too early to ascertain the impacts of mining and reclamation on water quality with a reasonable degree of confidence, especially for groundwater.

Fourth, there is a need to ensure protection or restoration of streams and related resources, including the headwater streams that are important to maintaining the ecological health and productivity of downstream waters. The existing rules have not always been applied in a manner sufficient to ensure protection or restoration of streams, especially with respect to the ecological function of streams. Maintenance, restoration, or establishment of streamside vegetative corridors or buffers, comprised of native species, for streams is a critical element of stream protection. In forested areas, riparian buffers for streams moderate the temperature of water in the stream, provide food (in the form of fallen leaves and other plant parts) for the aquatic food web, roots that stabilize stream banks, reduce surface runoff, and filter sediment and nutrients in surface runoff.

Fifth, there is a need to ensure that permittees and regulatory authorities make use of advances in information, technology, science, and methodologies related to surface and groundwater hydrology, surface-runoff management, stream restoration, soils, and revegetation, all of which relate directly or indirectly to protection of water resources.

Sixth, there is a need to ensure that land disturbed by surface coal mining operations is restored to a condition capable of supporting the uses that it was capable of supporting before any mining, including both those uses dependent upon stream protection or restoration and those uses that promote or support protection and restoration of streams and related environmental values. Existing rules and permitting practices have focused primarily on the land's suitability for a single approved postmining land use and they have not always been applied in a manner that results in the construction of postmining soils that provide a growth medium suitable for restoration of premining site productivity. A corollary need is to ensure that reclaimed mine sites are revegetated with native species unless and until a conflicting postmining land use, such as intensive agriculture, is implemented. Soil characteristics and the degree

and type of revegetation have a major impact on surface-water runoff quantity and quality as well as on aquatic life and the terrestrial ecosystems dependent upon perennial and intermittent streams. Under the existing rules, sites with certain postmining land uses have been revegetated with non-native species even when the postmining land use is not implemented prior to final bond release and even on those portions of the site where non-native species are not necessary to achieve the postmining land use.

These needs form the basis for our development of a reasonable range of Alternatives for the Proposed Stream Protection Rule. Nine Alternatives were carried forward for analysis in the FEIS, including the No Action Alternative and the Preferred Alternative. The Alternatives consist of a spectrum of combinations of the rule elements, with each Alternative including shared characteristics with other Alternatives but differing in some aspects of new requirements or the degree of improvement to existing regulations.

The following sections briefly describe the No Action Alternative, the Preferred Alternative, and then provide a comparison of all nine Alternatives carried forward in the FEIS. The sections are organized into four major groups of rule elements: protection of the hydrologic balance, activities in or near streams, approximate original contour (AOC) and AOC variances, and revegetation, topsoil, and fish and wildlife protection and enhancement.

Changes have occurred to the Preferred Alternative since the publication of the DEIS, and these are reflected in the summaries below. These changes were made after careful consideration of agency and public comment on the Proposed Rule, the DEIS, and the associated RIA. OSMRE also received comments on the other Alternatives presented in this EIS, as well as comments on potential Alternatives that OSMRE had not analyzed. The comments on the other Alternatives OSMRE considered were primarily questioning the practicality and cost of aspects of the Alternatives, and in many cases these comments also pertained to the Proposed Rule (the Preferred Alternative). No additional Alternatives were added to the EIS in response to comments for the reasons provided in the responses to comments (see the responses as included in Appendix K of this FEIS). In the year since the DEIS was published, OSMRE has taken a hard look at the body of comments received, and has coordinated closely with our federal and state regulatory partners to address concerns. As a result, OSMRE has determined that the Alternative 8 (Preferred), as revised, continues to provide the greatest effect towards reaching the objectives stated in the purpose and need for this rulemaking.

ES.4 Alternative 1 (No Action Alternative)

The No Action Alternative consists of the existing regulatory environment; it provides a baseline against which to compare the Action Alternatives. If the No Action Alterative is selected for implementation, no proposed regulatory revisions would be implemented. Thus, mining under this Alternative would continue to occur under our existing regulations. For reasons of brevity, OSMRE has described below only the requirements for surface coal mining operations. However, in most instances, analogous requirements apply to underground mining operations.

ES.4.1.1 Protection of the Hydrologic Balance (No Action Alternative)

ES.4.1.1.1 Baseline Data Collection and Analysis (No Action Alternative)

Under the current regulations, the applicant for a mining permit is required to submit, at a minimum, the following baseline information, and any additional hydrologic or geologic information required by the regulatory authority.[14]

Groundwater: Under 30 CFR 780.21, the applicant must submit data for existing wells, springs, and other groundwater resources within or adjacent to the proposed permit area. These data characterize the quality and quantity of groundwater and provide information on usage sufficient to demonstrate seasonal variation. Information on water quality must include total dissolved solids (TDS) or specific conductance, pH, total iron, and total manganese. Groundwater quantity information must include approximate rates of discharge or usage, as well as depth to the water in the coal seam, each water-bearing stratum above the coal seam, and each potentially affected stratum below the coal seam.

Surface water*:* Under 30 CFR 780.21, the applicant must submit information on surface water quality and quantity sufficient to demonstrate seasonal variation and water usage. At a minimum, water-quality information must include baseline information on total suspended solids (TSS), TDS or specific conductance, pH, total iron, and total manganese. The applicant must provide additional information on baseline acidity and alkalinity if there is a potential for acidic drainage from the proposed mining operation. Water quantity information must contain information on seasonal flow rates.

Geology*:* Under 30 CFR 780.22, the permit application must describe the geology of the proposed permit area and the adjacent area down to and including the deeper of either (1) the stratum immediately below the lowest coal seam to be mined or (2) any aquifer below that seam that could be adversely affected by mining. The description must include the areal and structural geology of the proposed permit area and the adjacent area. The description must also address other parameters that influence the required reclamation and the occurrence, availability, movement, quantity, and quality of potentially impacted surface water and groundwater. The geologic information must also include analyses of samples collected from test borings, drill cores, or samples from rock outcrops from the permit area. This requirement includes lithologic characterization and chemical analysis of strata and the coal seam for acid-forming or toxic-forming materials (including total sulfur, pyritic sulfur, and alkalinity-producing materials). The regulatory authority may waive analysis for alkalinity-producing materials and pyritic sulfur if sufficient data exists to document that the data is not needed.

ES.4.1.1.2 Monitoring During Mining and Reclamation (No Action Alternative)

The current regulations at 30 CFR 780.21(i) and (j) and 816.41(c) and (e) require monitoring of the quantity and quality of surface water and groundwater. The monitoring plan must include parameters related to the suitability of the water for current and approved postmining land uses, the hydrologic reclamation plan, and (for surface water) the effluent limitations in 40 CFR Part 434. At a minimum, pH,

[14] Unless otherwise specifically stated, the term “regulatory authority” as used in this EIS refers to the SMCRA regulatory authority.

total iron, total manganese, TDS or specific conductance, water levels (for groundwater), flow (for surface water), and TSS (for surface water) must be monitored every three months until final bond release. The permittee must monitor point-source discharges in accordance with their National Pollutant Discharge Elimination System (NPDES) permit. The monitoring plan must identify the monitoring locations, but the regulations do not establish criteria for the number or placement of monitoring locations.

The regulatory authority may modify or waive the monitoring requirements at any time if the permittee demonstrates that monitoring, in whole or in part, is no longer necessary to achieve the purposes set forth in the monitoring plan; that the operation has minimized disturbance to the hydrologic balance within the permit area and prevented material damage to the hydrologic balance outside the permit area; that water quality and quantity are suitable to support the approved postmining land uses; and that the water rights of other users have been protected or adequately replaced. However, the regulatory authority may not modify or waive NPDES monitoring requirements.

ES.4.1.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area (No Action Alternative)

The current regulations do not define material damage to the hydrologic balance outside the permit area. However, the preamble to existing 30 CFR 780.21(g) and 784.14(f) states that "because the gauges for measuring material damage may vary from area to area and from operation to operation," OSMRE has not established fixed criteria, except for those established under §§ 816.42 and 817.42 related to compliance with water quality standards and effluent limitations (48 FR 43973, Sept. 26, 1983). OSMRE further noted in the preamble to the existing rules that each regulatory authority should establish criteria to measure material damage to the hydrologic balance for purposes of cumulative hydrologic impact assessments (48 FR 43973, Sept. 26, 1983). Most state regulatory programs have not defined this term.

ES.4.1.1.4 Evaluation Thresholds (No Action Alternative)

The current regulations contain no requirement for specific evaluation thresholds. However, permit applicants proposing to conduct surface or underground coal mining are required under § 780.21(h) or § 784.14(g) respectively, to provide a plan of measures the applicant would take to avoid adverse potential adverse hydrologic consequences, including preventative and remedial measures. Under 30 CFR 816.41(c)(2) and (e)(2) and 817.41(c)(2) and (e)(2), if monitoring results demonstrate noncompliance with permit conditions or federal, state, or tribal water quality laws and regulations, the permittee must promptly notify the regulatory authority. The applicant must then take all possible steps to minimize any adverse impact to the environment or public health and safety, and must immediately implement measures necessary to comply with permit condition (30 CFR 773.17(e)).

ES.4.1.2 Activities in or Near Streams (No Action Alternative)

ES.4.1.2.1 Stream Definitions (No Action Alternative)

The current regulatory definitions of perennial, intermittent, and ephemeral streams use hydrologic characteristics and watershed size to define these waters (30 CFR 701.5). The current definitions do not include biological or chemical characteristics.

- Under the current regulations, a perennial stream is a stream or part of a stream that flows continuously during all of the calendar year because of groundwater discharge or surface runoff.
- An intermittent stream is (1) a stream or reach of a stream that drains a watershed of at least one square mile, *or* (2) a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains flow from both surface runoff and groundwater discharge.
- An ephemeral stream is a stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice, and which has a channel bottom that is always above the local water table.

The definition in the second bullet has sometimes been incorrectly interpreted as if the "or" was an "and;" i.e., the one-square-mile criterion has sometimes been applied as a threshold for all intermittent streams, when, in fact, a stream in a smaller watershed that meets the second criterion is an intermittent stream regardless of the size of its watershed.

ES.4.1.2.2 Activities in or near Streams (Including Disposal of Excess Spoil and Coal Mine Waste Facilities) (No Action Alternative)

The 1983 SBZ rule, 30 CFR 816.57, which is now back in effect (see 79 FR 76227-76233 (Dec. 22, 2014)), provides that mining activities may not disturb land within 100 feet of a perennial or an intermittent stream unless the regulatory authority specifically authorizes activities closer to, or through, such a stream. The regulatory authority may authorize such activities only after finding that the proposed activities would not cause or contribute to a violation of applicable federal or state water quality standards under the Clean Water Act and would not adversely affect the water quantity and quality or other environmental resources of the stream.

The 1983 SBZ rule does not specifically mention placement of excess spoil and coal mine waste in or within 100 feet of streams, but OSMRE and most state regulatory authorities generally have applied the 1983 SBZ rule in a manner that allows the construction of excess spoil fills, refuse piles, slurry impoundments, and sedimentation ponds in all types of streams and their buffer zones.

The existing regulations at 30 CFR 816.71 through 816.74 require that excess spoil fills be constructed by controlled placement of the excess spoil in lifts no greater than four feet thick, except that durable rock fills may be constructed by end-dumping, which is intended to result in the formation of underdrains by gravity segregation.

In general, only surface coal mining operations in steep-slope terrain generate excess spoil. Although not expressly required by regulation, most states with mining operations in steep-slope terrain have adopted policies intended to minimize the generation of excess spoil and thus reduce the size of excess spoil fills, which in turn would reduce the length of stream covered by those fills. In addition, the agencies administering the Clean Water Act have implemented policies that have reduced both the number of excess spoil fills and the length of stream covered by those fills. Furthermore, the regulations in 40 CFR Part 230 for implementation of section 404(b)(1) of the Clean Water Act require an analysis of all practicable alternatives to placement of fill material in waters of the United States, which would include most streams. Under those regulations, the applicant must select the Alternative with the least adverse effect on the aquatic ecosystem and mitigate any remaining adverse impacts on the aquatic environment.

ES.4.1.2.3 Mining Through Streams (No Action Alternative)

The 1983 version of the stream-channel diversion rules at 30 CFR 816.43 is now back in effect. Under 30 CFR 816.43(b)(1), the regulatory authority may approve diversion of perennial or intermittent streams within the permit area only after making the finding related to stream buffer zones in 30 CFR 816.57 that the diversion would not adversely affect the water quantity and quality and related environmental resources of the stream. Under 30 CFR 816.43(a), the applicant must design the diversion to minimize adverse impacts to the hydrologic balance within the permit and adjacent areas, prevent material damage to the hydrologic balance outside the permit area, and to assure the safety of the public. In addition, the applicant must design, locate, construct, maintain, and use the diversion to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow outside the permit area.

Under 30 CFR 816.43(b)(4), both the design and construction of stream-channel diversions for perennial and intermittent streams must be certified by a qualified registered professional engineer as meeting applicable performance standards and any design criteria established by the regulatory authority. Under 30 CFR 816.43(a)(3), the design for restored stream channels for perennial and intermittent streams (or permanent diversion channels for those streams) must restore or approximate the premining characteristics of the original stream channel, including the natural riparian vegetation. Under 30 CFR 816.43(b)(2), the design capacity for both temporary and permanent stream-channel diversions must at least equal the capacity of the unmodified stream channel immediately upstream and downstream of the diversion.

ES.4.1.3 Approximate Original Contour (AOC) and AOC Variances (No Action Alternative)

ES.4.1.3.1 Surface Configuration (No Action Alternative)

Under existing 30 CFR 780.18(b) (3), each permit application must include a plan for backfilling, soil stabilization, and compacting and grading. Contour maps or cross-sections must show the anticipated final surface configuration. The performance standards at 30 CFR 816.102, 816.104, 816.105, 816.106, and 816.107 require that disturbed areas be backfilled and regraded to closely resemble the premining surface configuration, with exceptions for thin and thick overburden situations, previously mined areas, and certain other circumstances. The regulations allow permanent impoundments, including final-cut impoundments, provided they do not otherwise create conflicts with achieving AOC and they meet the design, construction, maintenance, postmining land use, and other requirements in 30 CFR 800.40(c)(2), 816.49(b), and 816.133.

ES.4.1.3.2 AOC Variances (No Action Alternative)

The current regulations provide for the approval of permits for mountaintop removal mining operations, which are exempt from AOC restoration requirements if the postmining land use and postmining surface topography requirements of paragraphs (3) and (4) of Section 515(c) of SMCRA are met. The regulations also provide for the approval of AOC variances for steep-slope mining operations under certain conditions.

As described in 30 CFR 785.14(b), mountaintop removal mining operations are surface mining activities in which the mining operation removes an entire coal seam or seams running through the upper fraction

of a mountain, ridge or hill by removing substantially all of the overburden off the bench and creating a level plateau or gently rolling contour, with no highwalls remaining. To obtain a permit for mountaintop removal mining operations, the proposed postmining land use must be a commercial, industrial, residential, agricultural, or public facility land use. The regulatory authority must find that the proposed postmining land use meets all requirements for alternative postmining land uses and is an equal or better economic or public use of the land compared to its premining use. The permit application must include specific plans for the proposed postmining land use, including assurance of investment in public facilities and documentation of private financial capability to ensure completion. The current regulations do not require implementation of the approved postmining land use prior to final bond release or thereafter.

Under 30 CFR 824.11(a)(9), the regulatory authority may approve a permit for a mountaintop removal mining operation only upon a demonstration that there would be no damage to natural watercourses below the lowest coal seam to be mined. The regulations do not define the term "no damage." Natural watercourses above the lowest coal seam mined are not protected from damage.

Under 30 CFR 824.11(a) (6), the permittee must leave an outcrop barrier in place at the toe of the lowest coal seam mined to ensure stability.

As defined in 30 CFR 701.5, steep slopes are any slope of more than 20° or a lesser slope designated by the regulatory authority after consideration of soil, climate, and other characteristics of a region or State. To obtain an AOC variance for steep-slope mining operations under 30 CFR 785.16, the proposed postmining land use must be of an industrial, commercial, residential, or public (including recreational facilities) nature. It also must meet the requirements in 30 CFR 816.133 for approval of alternative postmining land uses, which, among other things, means that the postmining use must be an equal or better economic or public use. The applicant must demonstrate that the proposed operation will improve the watershed when compared to either premining conditions or the conditions that would exist if the applicant restored the area to AOC after mining. The regulatory authority can concur that the operation would improve the watershed only if the operation would reduce the amount TSS or other pollutants discharged from the permit area to surface water or groundwater *or* reduce the flood hazards within the watershed by a reduction of the peak-flow discharge from precipitation events or thaws. In both cases, the total volume of flow from the proposed permit area during every season of the year must not vary in a way that adversely affects the ecology of any surface water or any existing or planned use of surface water or groundwater.

ES.4.1.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement (No Action Alternative)

ES.4.1.4.1 Revegetation, Reforestation and Topsoil Management (No Action Alternative)

Under 30 CFR 816.133(a), the permittee must restore all disturbed areas to a condition in which they are capable of supporting the uses that they were capable of supporting before any mining or higher or better uses.

Under 30 CFR 816.22, the permittee must salvage and redistribute all topsoil (the A and E soil horizons), unless alternative overburden materials are approved as being equal to or better than the existing available topsoil to support vegetation. The permittee also must demonstrate that the selected overburden materials

they propose to use as topsoil substitutes and supplements are the best available material within the permit area. Paragraph (e) of 30 CFR 816.22 provides that the regulatory authority may require salvage and redistribution of the subsoil (the B and C soil horizons) or other underlying strata if it finds that those layers are necessary to comply with the revegetation performance standards in 30 CFR 816.111 through 816.116.

Paragraph (d) of 30 CFR 816.22 requires that the permittee redistribute topsoil and topsoil substitutes and supplements in a manner that achieves an approximately uniform, stable thickness when consistent with the approved postmining land use, contours, and surface water drainage systems. Soil thickness may vary to the extent necessary to meet the specific revegetation goals identified in the permit. The permittee also must redistribute soil materials in a manner that prevents excess compaction and protects the materials from wind and water erosion before and after seeding and planting.

Under 30 CFR 816.116, revegetation success standards must be based upon the effectiveness of the vegetation to support the approved postmining land use, the extent of ground cover compared to the cover provided by the natural vegetation of the area, and the general requirements of 30 CFR 816.111. These general requirements provide that the vegetative cover must be diverse, effective, and permanent; comprised of species native to the area (with certain exceptions); at least equal in extent of cover to the natural vegetation of the area; capable of stabilizing the soil surface from erosion; compatible with the postmining land use; have the same seasonal characteristics of growth as the original vegetation; be capable of self-regeneration and plant succession; be compatible with the plant and animal species of the area; and meet the requirements of state and federal laws and regulations concerning seeds, poisonous and noxious plants, and introduced species. The regulations provide exceptions to some of these requirements for agricultural crops and for plantings used to establish temporary cover.

ES.4.1.4.2 Fish and Wildlife Protection and Enhancement (No Action Alternative)

Under 30 CFR 780.16(a), each permit application must include fish and wildlife resource information for the proposed permit area and the adjacent area. The regulatory authority must determine the scope and level of detail of that information in consultation with state and federal agencies with responsibility for fish and wildlife. Paragraph (b) of 30 CFR 780.16 requires that the permit application also include a fish and wildlife protection and enhancement plan. Paragraph (c) of 30 CFR 780.16 requires that the regulatory authority provide the fish and wildlife resource information and the fish and wildlife protection and enhancement plan to the U.S. Fish and Wildlife Service (U.S. FWS) upon request.

Under the current regulations at 30 CFR 816.97(a), the mine operator must, to the extent possible using the best technology currently available minimize disturbances and adverse impacts to fish, wildlife, and related environmental values and enhance such resources where practicable.

Under 30 CFR 816.97(b), surface mining activities must not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973 (16 U.S.C. §§1531 to 1599). On September 24, 1996, the U.S. FWS issued a biological opinion and conference report to OSMRE (1996 biological opinion) on the continuation and approval and conduct of surface coal mining and reclamation operations under state and federal regulatory programs adopted pursuant SMCRA where such operations may adversely affect species listed as threatened or endangered or designated critical habitat

under the Endangered Species Act (ESA). The 1996 biological opinion explains how this requirement is designed to be implemented; it also provides an incidental take statement. The 1996 biological opinion states that the regulatory authority must "implement and require compliance with any species-specific protective measures developed by the U.S. FWS field office and the regulatory authority (with the involvement, as appropriate, of the permittee and OSM[RE])." The 1996 biological opinion further provides that, "[w]henever the regulatory authority decides not to implement one or more of the species-specific measures recommended by the U.S. FWS, it must provide a written explanation to the U.S. FWS. If the U.S. FWS field office concurs with the regulatory authority's action, it would provide a concurrence letter as soon as possible. However, if the U.S. FWS does not concur, the issue must be elevated through the chain of command of the regulatory authority, the U.S. FWS, and (to the extent appropriate) OSM[RE] for resolution." OSMRE is coordinating with the U.S. FWS on a MOU, from this point forward in the FEIS to be referred to as the ESA MOU, to provide guidance to OSMRE, the U.S. FWS, and the regulatory authorities for demonstrating compliance with the terms and conditions of the Incidental Take Statement accompanying the 1996 biological opinion, which provides incidental take coverage for any take resulting from a proposed coal mining and reclamation operation. The ESA MOU, while still in development as of publication of this document, is part of the current regulatory environment because it adds no new requirements but instead merely provides guidance on existing ones.

Under 30 CFR 816.97(f), the permittee must avoid disturbances to wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes; permittees must enhance where practicable, restore, or replace these resources. Likewise, surface mining activities must also avoid disturbances to habitats of unusually high value for fish and wildlife; these resources must be restored or enhanced where practicable.

Where fish and wildlife habitat is to be a postmining land use, 30 CFR 816.97(g) requires that the plant species to be used on reclaimed areas be selected based upon their proven nutritional value for fish or wildlife, their use as cover for fish or wildlife, and their ability to support and enhance fish or wildlife habitat after bond release. Paragraph (g) also requires that the plants selected be grouped and distributed in a manner that optimizes edge effect, cover, and other benefits to fish and wildlife.

The remaining paragraphs of 30 CFR 816.97 identify assorted other measures that permittees must implement during and after mining to minimize damage to fish and wildlife resources and their habitats or to ensure that all postmining land uses provide some fish and wildlife habitat or travel corridors to the extent practicable.

ES.5 Alternative 8 (Preferred Alternative)

The Preferred Alternative (Alternative 8 in the EIS) is comprised of selected primary stream protection and fish and wildlife conservation elements of the other Action Alternatives analyzed. These elements include: defining material damage to the hydrologic balance outside the permit area, enhancing baseline data collection, monitoring and regulatory authority review, requiring restoration of the ecological function of perennial and intermittent streams that are mined through, requiring fish and wildlife enhancements for perennial and intermittent stream reaches buried by excess spoil or coal mine waste, prohibiting mountaintop removal mining operations from damaging natural watercourses, and requiring reforestation of previously forested areas.

ES.5.1.1 Protection of the Hydrologic Balance (Preferred Alternative)

ES.5.1.1.1 Baseline Data Collection and Analysis (Preferred Alternative)

The Preferred Alternative (Alternative 8) requires that the applicant to obtain information on stream flow, sediment load, all rainfall/storm events, stream chemical, physical and hydrologic form and stream ecological function for streams as a baseline. The information required is summarized as follows:

- Surface water: The applicant must provide surface-water quantity descriptions for perennial and intermittent streams within the proposed permit and adjacent areas and collect surface water samples for 12 consecutive months at approximately equally spaced monthly intervals. Under the final version of the Preferred Alternative, OSMRE has revised the collection requirements (since initially proposed) to allow the applicant to modify the interval between samples to allow for adverse weather conditions that would make it unsafe to travel to sampling locations.
- Groundwater: The applicant must measure the levels of groundwater in perched, regional, and local aquifers within the proposed permit and adjacent areas at approximately equally spaced monthly intervals for a minimum of 12 consecutive months. As with surface waters under the final version of the Preferred Alternative, OSMRE has revised the requirements to allow the applicant to modify the interval between groundwater samples to allow for adverse weather conditions that would make it unsafe to travel to sampling locations. OSMRE has also revised this Alternative to allow the applicant, with regulatory authority approval, to measure groundwater levels on a quarterly basis instead of monthly, but this would extend the minimum data-gathering period to 24 consecutive months.
- Parameters: The applicant must analyze surface water and groundwater samples and expand the suite of parameters subject to analysis to include: temperature, aluminum, bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, hot acidity, total alkalinity, major anions and cations, pH, selenium, specific conductance, total dissolved solids (TDS), total iron, total manganese, total suspended solids, and any other parameter identified in any applicable National Pollutant Discharge Elimination System permit. Under the final version of the Preferred Alternative, OSMRE deleted the six parameters (ammonia, arsenic, cadmium, copper, nitrogen, zinc), which were previously requested by EPA in the Proposed Rule. Our research found that those parameters have little or no nexus to coal mining. However, OSMRE added temperature as a mandatory baseline data collection and monitoring parameter for both surface water and groundwater, and a requirement for the applicant to collect baseline (and monitoring) data for all parameters of concern, as determined by the regulatory authority, regardless of whether the regulations specifically identify those parameters.
- Form of streams: Under the final version of the Preferred Alternative, the applicant must provide a detailed description of stream channel characteristics for perennial and intermittent streams located within the proposed permit area. General descriptions are required for ephemeral stream channels located within the proposed permit area. OSMRE decided not to apply this requirement to streams within adjacent areas (as previously proposed under this Alternative) because it is only within the permit area that channel characteristics are likely to be altered by mining.
- Biological condition of streams: Under the final version of the Preferred Alternative, OSMRE has removed the requirement for measurement of the biological condition of ephemeral streams. For perennial streams, this Alternative requires use of a scientifically defensible bioassessment

protocol that will provide index values for both stream habitat and aquatic biota based on the reference condition. The protocol must be accepted by the agencies responsible for implementing the Clean Water Act and it must require identification of benthic macroinvertebrates to the genus level where possible, otherwise to the lowest practical taxonomic level. The same requirement applies to intermittent streams if scientifically defensible protocols have been developed for those streams. If no such protocols exist, the baseline data requires a description of the biology of each intermittent stream within the proposed permit area and each intermittent stream in the adjacent area that could be affected by the proposed operation.

- Wetlands: Under the final version of the Preferred Alternative, OSMRE has added a requirement that the permit applicant identify the extent and quality of wetlands adjoining all streams within the proposed permit area, and wetlands adjoining perennial and intermittent streams that occur in adjacent areas.
- Precipitation: The applicant is required to use continuous recording devices to record all precipitation and storm events to provide baseline data that is adequate to generate and calibrate a hydrologic model of the site. Under the final version of the Preferred Alternative, OSMRE is not adopting the proposed requirement that the regulatory authority extend the baseline data collection period if the Palmer Drought Severity Index for that period exceeded certain values. Historical data indicate that there are few 12-month periods in which the selected values would not exist for at least part of the time. Instead, the Preferred Alternative would require that the applicant identify the Palmer Drought Severity Index values for the period during which baseline data were collected. The regulatory authority then would have the discretion to determine whether and how long to extend the baseline data collection period under conditions of extreme drought or abnormally high precipitation.
- Geology: Requires collection of geologic data for the proposed permit and adjacent areas, with a focus on geological characteristics and properties that influence the hydrologic regime or that could alter the availability or quality of groundwater and surface water.

ES.5.1.1.2 Monitoring During Mining and Reclamation (Preferred Alternative)

As with the Preferred Alternative proposed in the DEIS, the Preferred Alternative continues to require monitoring of surface water and groundwater during mining and reclamation at least quarterly for the same parameters measured during baseline sampling at locations designated in the permit. As revised, the Preferred Alternative requires the applicant to monitor the biological condition of perennial streams and intermittent streams for which scientifically defensible bioassessment protocols exist annually until final bond release.

The Preferred Alternative now contains an additional requirement that the regulatory authority establish threshold values for water quality and quantity parameters that, when exceeded, as documented by monitoring, would result in an evaluation by the regulatory authority and the Clean Water Act authority to determine the reason for the exceedance. The Preferred Alternative continues to require that the permittee collect on-site precipitation measurements using self-recording rain gauges. Precipitation records must be adequate to generate and calibrate a hydrologic model of the site in the event the regulatory authority requires modeling.

Under the final Preferred Alternative, OSMRE has clarified that the regulatory authority must reevaluate the cumulative hydrologic impact assessment (CHIA) at intervals not to exceed three years. This evaluation must include a review of biological and water monitoring data from both this operation and all other coal mining operations within the cumulative impact area. The Preferred Alternative continues to require an inspection of the surface water runoff-control system following storm events that recur on a two-year or greater interval. The Preferred Alternative also continues to require the operator to submit a report after such an event that describes the performance of the hydraulic control structures, assesses and describes any potential material damage to the hydrologic balance, and addresses any remedial measures taken. In the Preferred Alternative, OSMRE has revised the requirement for how soon the regulatory authority must receive the report, from the previously proposed 48 hours to 30 days.

The Preferred Alternative continues to require that monitoring continue until final bond release. Under this Alternative, OSMRE added a requirement for restoration of the hydrologic function of mined-through perennial and intermittent streams before the regulatory authority may approve a Phase II bond release application. As proposed, the regulatory authority may not grant final Phase III bond release until the permittee demonstrates restoration of the ecological function of mined-through perennial and intermittent streams.

ES.5.1.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area (Preferred Alternative)

The Preferred Alternative in the DEIS defined material damage to the hydrologic balance outside the permit area as any adverse impact from surface or underground mining operations, including subsidence, on the quantity or quality of surface water or groundwater, or on the biological condition of a perennial or intermittent stream, that would preclude attainment or continuance of any designated surface water use under sections 101(a) and 303(c) of the Clean Water Act or any existing or reasonably foreseeable use of surface water or groundwater outside the permit area. OSMRE has revised the Preferred Alternative definition of material damage to the hydrologic balance outside the permit area by removing all criteria and instead providing a list of factors that the regulatory authority, in consultation with the Clean Water Act authority, must consider in identifying material damage thresholds.

When selecting material damage thresholds, the revised Preferred Alternative requires that the regulatory authority, in consultation with the Clean Water Act authority as appropriate undertake a comprehensive evaluation that considers baseline data, the PHC determination, applicable water quality standards under the Clean Water Act, applicable state or tribal standards of surface water or groundwater, ambient water quality criteria developed under section 304(a) of the Clean Water Act, the biological requirements of species listed as threatened or endangered under the Endangered Species Act of 1973, and other pertinent information and considerations to identify the parameters for which thresholds are necessary. Thresholds may be either numeric or narrative, with the exception that, at the discretion of the Clean Water Act authority, numeric thresholds are required for relevant contaminants for which there are water quality criteria under the Clean Water Act. The intent of these changes is to ensure that the definition of this term does not foreclose the possibility of approving permits in watersheds with impaired streams, which could in turn drive mining into watersheds with higher quality streams.

ES.5.1.1.4 Evaluation Thresholds (Preferred Alternative)

The Preferred Alternative in the DEIS did not include a requirement for specific evaluation thresholds. Instead, the Preferred Alternative relied on existing regulations that require permit applicants proposing to conduct surface or underground coal mining under § 780.21(h) or § 784.14(g) respectively, to provide a plan of measures the applicant would take to avoid adverse potential adverse hydrologic consequences, including preventative and remedial measures. The Preferred Alternative in the DEIS also relied on existing requirements at 30 CFR 816.41(c)(2) and (e)(2) and 817.41(c)(2) and (e)(2) that state that if monitoring results demonstrate noncompliance with permit conditions or federal, state, or tribal water quality laws and regulations, the permittee must promptly notify the regulatory authority and then take all possible steps to minimize any adverse impact to the environment or public health and safety, and must immediately implement measures necessary to comply with permit conditions (30 CFR 773.17(e)).

In the Preferred Alternative, as revised, OSMRE has added a requirement that the permit include evaluation thresholds for critical water quality and quantity parameters as determined by the regulatory authority. An exceedance of an evaluation threshold, as documented by monitoring, would result in an evaluation by the regulatory authority and the Clean Water Act authority to determine the reason for the exceedance. If the evaluation determines that discharges from the mining operation were responsible for the exceedance and that exceedances are likely to reoccur in the absence of corrective action, the regulatory authority must issue a permit revision order requiring that the permittee reassess the PHC determination and the hydrologic reclamation plan and develop measures to prevent material damage to the hydrologic balance outside the permit area.

ES.5.1.2 Activities in or near Streams (Preferred Alternative)

ES.5.1.2.1 Stream Definitions (Preferred Alternative)

The Preferred Alternative as described in the DEIS redefined “perennial stream” in a manner that is substantively identical to the manner in which the U.S. Army Corps of Engineers (USACE) defines that term in Part F of the 2012 reissuance of the nationwide permits under section 404 of the Clean Water Act. See 77 FR 10184, 10288 (Feb. 21, 2012). In response to comments, OSMRE has revised the Preferred Alternative definitions of ephemeral, intermittent, and perennial streams to limit the scope of those terms to conveyances with channels that have a bed-and-bank configuration and an ordinary high water mark, which is consistent with the approach taken by the USACE in implementing section 404 of the Clean Water Act. This change means that our rules would no longer classify an ephemeral drainage that does not have a bed-and bank configuration and an ordinary high water mark as an ephemeral stream. In the final version of the Preferred Alternative, OSMRE clarifies that a stream with a bed that is always above the water table and with flows arising solely from snowmelt and precipitation events would be classified as ephemeral.

ES.5.1.3 Activities in or near Streams and Mining through Streams (Preferred Alternative)

In the DEIS, Alternative 8 (Preferred) would have prohibited mining activities in or through perennial and intermittent streams or on the surface of land within 100 feet of those streams unless the applicant makes certain demonstrations and the regulatory authority makes the corresponding findings listed below, that the proposed activity would not—

(1) Preclude attainment of the designated uses of that stream segment under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), before mining, or, if there are no designated uses, the premining uses of that stream segment; or

(2) Result in that stream segment not meeting the applicable anti-degradation requirements under section 303(c) of the Clean Water Act, 33 U.S.C. 1313(c), as adopted by a state or authorized tribe or as promulgated in a federal rulemaking under the Clean Water Act.

These requirements would apply to all mining activities except the construction of excess spoil fills and coal mine waste disposal facilities that cover perennial or intermittent streams (excess spoil fills and coal mine waste disposal facilities that extend into the buffer zone, but not the stream itself, are not exempt.)

As revised, Alternative 8 (Preferred) would prohibit mining activities in or through perennial and intermittent streams or on the surface of land within 100 feet of those streams unless the applicant makes the demonstrations and the regulatory authority makes the corresponding findings in Table ES.5-1.

Table ES.5-1.

Required Demonstrations for Activities in or within 100 feet of a Perennial or Intermittent Stream

1	2	3	4
When indicated in columns 2 through 4 of this table, your application must contain the demonstrations in column 1 if you propose to conduct surface mining activities in or through a perennial or intermittent stream or on the surface of land within 100 feet of a perennial or intermittent stream.	Any activity other than an activity listed in column 3 or column 4	Mining through or permanently diverting a stream	Construction of an excess spoil fill, coal mine waste refuse pile, or impounding structure that encroaches upon any part of a stream
(i) The proposed activity would not cause or contribute to a violation of applicable water quality standards adopted under the authority of section 303(c) of the Clean Water Act, 33 U.S.C. 1313(c), or other applicable state or tribal water quality standards.	Yes	Yes	Yes
(ii) The proposed activity would not cause material damage to the hydrologic balance outside the permit area.	Yes	Yes	Yes
(iii) The proposed activity would not result in conversion of the affected stream segment from perennial to ephemeral.	Yes	Yes	Not applicable

1	2	3	4
When indicated in columns 2 through 4 of this table, your application must contain the demonstrations in column 1 if you propose to conduct surface mining activities in or through a perennial or intermittent stream or on the surface of land within 100 feet of a perennial or intermittent stream.	Any activity other than an activity listed in column 3 or column 4	Mining through or permanently diverting a stream	Construction of an excess spoil fill, coal mine waste refuse pile, or impounding structure that encroaches upon any part of a stream
(iv) The proposed activity would not result in conversion of the affected stream segment from intermittent to ephemeral or from perennial to intermittent.	Yes	Yes, except as provided in paragraphs (e)(2) and (5) of this section	Not applicable
(v) There is no practicable alternative that would avoid mining through or diverting a perennial or intermittent stream.	Not applicable	Yes, except as provided in paragraph (e)(3) of this section	Yes
(vi) After evaluating all potential upland locations in the vicinity of the proposed operation, including abandoned mine lands and unreclaimed bond forfeiture sites, there is no practicable alternative that would avoid placement of excess spoil or coal mine waste in a perennial or intermittent stream.	Not applicable	Not applicable	Yes
(vii) The proposed operation has been designed to minimize the extent to which perennial or intermittent streams will be mined through, diverted, or covered by an excess spoil fill, a coal mine waste refuse pile, or a coal mine waste impounding structure.	Not applicable	Yes, except as provided in paragraphs (e)(3) and (5) of this section	Yes
(viii) The stream restoration techniques in the proposed reclamation plan are adequate to ensure restoration or improvement of the form, hydrologic function (including flow regime), streamside vegetation, and ecological function of the stream after you have mined through it, as required by § 816.57 of this chapter.	Not applicable	Yes, except as provided in paragraph (e)(5) of this section	Not applicable

1		2	3	4
When indicated in columns 2 through 4 of this table, your application must contain the demonstrations in column 1 if you propose to conduct surface mining activities in or through a perennial or intermittent stream or on the surface of land within 100 feet of a perennial or intermittent stream.		Any activity other than an activity listed in column 3 or column 4	Mining through or permanently diverting a stream	Construction of an excess spoil fill, coal mine waste refuse pile, or impounding structure that encroaches upon any part of a stream
(ix)	The proposed operation has been designed to minimize the amount of excess spoil or coal mine waste that the proposed operation will generate.	§ 780.35(b) of this part requires minimization of excess spoil	§ 780.35(b) of this part requires minimization of excess spoil	Yes
(x)	To the extent possible using the best technology currently available, the proposed operation has been designed to minimize adverse impacts on fish, wildlife, and related environmental values.	Yes	Yes	Yes
(xi)	The fish and wildlife enhancement plan prepared under § 780.16 of this part includes measures that would fully and permanently offset any long-term adverse impacts on fish, wildlife, and related environmental values within the footprint of each excess spoil fill, coal mine waste refuse pile, and coal mine waste impounding structure.	Not applicable	Not applicable	Yes
(xii)	Each excess spoil fill, coal mine waste refuse pile, and coal mine waste impounding structure has been designed in a manner that will not result in the formation of toxic mine drainage.	Not applicable	Not applicable	Yes
(xiii)	The revegetation plan prepared under § 780.12(g) of this part requires reforestation of each completed excess spoil fill if the land is forested at the time of application or if the land would revert to forest under conditions of natural succession.	Not applicable	Not applicable	Yes

Alternative 8 (Preferred) would require the applicant to demonstrate that (1) the operation has been designed to minimize, to the extent possible, the volume of excess spoil that the operation would generate and (2) the designed maximum cumulative volume of all proposed excess spoil fills is no larger than the

capacity needed to accommodate the anticipated cumulative volume of excess spoil that the operation would generate.

Under Alternative 8 (Preferred), the permittee must construct excess spoil fills in lifts not to exceed four feet in thickness. The use of end-dumping for final placement would be prohibited and the current regulation at 30 CFR 816.73 allowing construction of durable rock fills that rely upon end-dumping and the construction of underdrains by gravity segregation of the end-dumped material would be eliminated. This Alternative would require daily monitoring during excess spoil placement and that the quarterly inspection reports filed with the regulatory authority include the daily monitoring logs. Alternative 8 (Preferred) would prohibit the construction of excess spoil fills with flat decks on the top surface.

ES.5.1.4 Approximate Original Contour (AOC) and AOC Variances (Preferred Alternative)

ES.5.1.4.1 Surface Configuration (Preferred Alternative)

The Preferred Alternative is the same as Alternative 1, the No Action Alternative, with minor revisions to the definition of AOC to clarify its meaning, reflect state program amendment actions, and address implementation issues. Under the Preferred Alternative, AOC means that surface configuration achieved by backfilling and grading of the mined area so that the reclaimed area closely resembles the general surface configuration of the land within the permit area prior to any mining activities or related disturbances and blends into and complements the drainage pattern of the surrounding terrain. All highwalls and spoil piles must be eliminated to meet the terms of the definition, but that requirement does not prohibit the approval of terracing, the retention of access roads or the approval of permanent water impoundments. For purposes of this definition, the term “mined area” does not include excess spoil fills and coal refuse piles.

Alternative 8 (Preferred) also requires that the postmining drainage pattern of perennial, intermittent, and ephemeral stream channels be similar to the premining drainage pattern, unless the regulatory authority approves a different pattern to ensure stability; prevent or minimize downcutting of reconstructed stream channels; promote enhancement of fish and wildlife habitat; accommodate any anticipated temporary or permanent increase in surface runoff as a result of mining and reclamation; accommodate the construction of excess spoil fills, coal mine waste refuse piles, or coal mine waste impounding structures; replace a stream that was channelized or otherwise severely altered prior to submittal of the permit application with a more natural and ecologically sound drainage pattern or stream-channel configuration; or reclaim a previously mined area.

ES.5.1.4.2 AOC Variances (Preferred Alternative)

Alternative 8 (Preferred) would allow mountaintop removal mining operations and AOC variances for steep-slope mining operations under conditions generally similar to those in Alternative 1, the No Action Alternative. However, Alternative 8 (Preferred) would impose additional requirements to better protect streams, aquatic ecology, and biological communities. In addition, it would require that the permit include a condition prohibiting any bond release before substantial implementation of the approved postmining land use.

For approval of mountaintop removal mining operations, Alternative 8 (Preferred) would require the permit applicant to demonstrate that no damage would result to natural watercourses within the proposed

permit and adjacent areas. The applicant can meet this requirement by making all of the following demonstrations:

- There would be no adverse changes in parameters of concern in discharges to surface water and groundwater;
- Flood hazards within the watershed containing the proposed permit area will be diminished by reduction of the size or frequency of peak-flow discharges from precipitation events or thaws.; and
- The total volume of flow during any season of the year would not vary from premining conditions; i.e., the seasonal flow regime would not change and there would be no increase in potential damage from flooding sufficient to adversely affect any designated use of surface water outside the proposed permit area under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), or, if there are no designated uses, any premining use of surface water outside the proposed permit area. Variations must also not adversely affect any premining use of groundwater outside the proposed permit area.
- The proposed operation would not result in any greater adverse impact to the aquatic and terrestrial ecology of the proposed permit and adjacent area than would occur if the area to be mined was restored to its approximate original contour.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application, unless reforestation would be inconsistent with the postmining land use. Finally, the permittee must install drains through the outcrop barrier to prevent saturation of the backfill.

For approval of steep-slope variances, Alternative 8 (Preferred) would, in addition to the requirements in the existing rules, require permit applicants to demonstrate that all of the following criteria are met:

- The operation, including any fish and wildlife enhancement measures, will result in fewer adverse impacts to the aquatic ecology of the cumulative impact area than would occur if the site were mined and restored to AOC;
- The variance would not result in construction of an excess spoil fill in an intermittent or perennial stream; and
- Any deviations from the premining surface configuration are necessary and appropriate to achieve the postmining land use.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application or would revert to forest under natural succession. This requirement would not apply to permanent impoundments, roads, and other impervious surfaces to be retained following mining and reclamation or to those portions of the permit area covered by the variance.

ES.5.1.5 Revegetation, Soils, Fish and Wildlife Protection and Enhancement (Preferred Alternative)

ES.5.1.5.1 Revegetation & Soils

Alternative 8 (Preferred) includes provisions similar to those of the No Action Alternative with respect to soil management and revegetation, but with a greater emphasis on restoration of the site's ability to

support the uses it supported before any mining, regardless of the approved postmining land use. Alternative 8 (Preferred) also places greater emphasis on construction of a growing medium with an adequate root zone for deep-rooted species and on revegetation with native tree and plant species, especially reforestation of previously forested areas.

Like the No Action Alternative, Alternative 8 (Preferred) requires salvage and redistribution of all topsoil (the A and E soil horizons). However, it also requires salvage and redistribution of the B and C soil horizons (or other suitable overburden materials) to the extent necessary to achieve a growing medium with the optimal rooting depths required to restore premining land use capability or comply with revegetation requirements. Under the No Action Alternative, the regulatory authority has the discretion, but not necessarily the obligation, to require salvage and redistribution of the B and C soil horizons or other suitable overburden materials.

Alternative 8 (Preferred) allows use of selected overburden materials as substitutes for (or supplements to) either topsoil or subsoil or both only if the applicant demonstrates that either (1) the quality of the existing topsoil and subsoil is inferior to that of other overburden materials or (2) the quantity of the existing topsoil and subsoil is insufficient to provide the optimal rooting depth or meet other plant growth requirements. Alternative 8 (Preferred) differs slightly from the No Action Alternative in that the No Action Alternative allows the use of topsoil substitutes or supplements when the resulting soil medium will be equally or more suitable than the existing topsoil to sustain vegetation, while Alternative 2 allows their use only when the resulting soil medium will be more suitable to sustain vegetation.

Under Alternative 8 (Preferred), the permittee must salvage and redistribute all organic matter contained in or above the A soil horizon. Salvaging these materials would increase the moisture retention capability of the soil and provide a source of the seeds, plant propagules, mycorrhizae, and other soil flora and fauna needed to support and enhance reestablishment of locally adapted and genetically diverse plant communities as well as to improve soil productivity. The final version of Alternative 8 (Preferred) provides limited exceptions to the requirement for redistribution of salvaged organic material. The final version of Alternative 8 (Preferred) also requires that permit applications identify areas with substantial populations of invasive or noxious non-native species. The final version prohibits salvage and redistribution of organic materials from those areas. Instead, the operator must bury these materials at a depth sufficient to prevent regeneration.

Under Alternative 8 (Preferred), the permittee must reforest lands that were previously forested, or that would naturally revert to forest under conditions of natural succession, in a manner that would enhance recovery of the native forest ecosystem as expeditiously as possible. Prime farmland historically used for cropland is exempt from this requirement. The permittee must revegetate the entire reclaimed area (other than water areas and impervious surfaces like roads and buildings) using native species to restore or reestablish the plant communities native to the area unless a conflicting postmining land use is actually implemented before the end of the revegetation responsibility period.

ES.5.1.5.2 Fish and Wildlife Protection and Enhancement

Alternative 8 (Preferred) is similar to the No Action Alternative with respect to the protection of threatened and endangered species. At the DEIS stage, this Alternative would have included dispute resolution procedures in the regulations, codifying these procedures. In response to agency and public

comment, OSMRE has removed this from the final version of the Preferred Alternative.[15] However, Alternative 8 (Preferred) would make it a requirement that the applicant demonstrate to the regulatory authority that the proposal is in compliance with the Endangered Species Act of 11973, 16 U.S.C. 1531 et seq. through one of the following mechanisms:

(1) Providing documentation that the proposed surface coal mining and reclamation operations within or adjacent to the permit area would have no effect on species listed or proposed for listing as threatened or endangered under the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq., habitat occupied by those species, or on designated or proposed critical habitat, under that law; or

(2) Documenting compliance with a valid biological opinion that covers issuance of permits for surface coal mining operations and the conduct of those operations under the applicable regulatory program; or

(3) Providing documentation that interagency consultation under section 7 of the Endangered Species Act of 1973, 16 U.S.C. 1536, has been completed for the proposed operation; or

(4) Providing documentation that the proposed operation is covered under a permit issued pursuant to section 10 of the Endangered Species Act of 1973, 16 U.S.C. 1539.

Revised Alternative 8 (Preferred) requires that the applicant describe the steps that that applicant has taken or will take to comply with the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq. It also provides that the regulatory authority may not approve the permit application before there is a demonstration of compliance with the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq., through one of the mechanisms listed above.

Alternative 8 (Preferred) is similar to the No Action Alternative with respect to the fish and wildlife resource information and protection and enhancement plan required in the permit application. It also includes similar performance standards for protection of fish and wildlife. However, Alternative 8 (Preferred) requires that the permittee establish permanent streamside vegetative corridors at least 100 feet wide, comprised of native, non-invasive species, along the banks of restored or diverted ephemeral, intermittent or perennial stream channels.

In addition, fish and wildlife enhancement measures would be mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant communities, or filling of a segment of a perennial or intermittent stream. The enhancement measures must be commensurate with the long-term adverse impact to the affected resources and they must be located in the same watershed as the proposed operation (or the nearest appropriate adjacent watershed if there are no opportunities for enhancement within the same watershed). Enhanced areas must be included within the

[15] OSMRE has undertaken formal Section 7 consultation with the U.S. FWS on the Preferred Alternative. The biological opinion, once issued, will be available on www.osmre.gov and on www.regulations.gov under the Stream Protection Rule docket. OSMRE is also coordinating with U.S. FWS to provide guidance to OSMRE, the U.S. FWS, and regulatory authorities for demonstrating compliance with the terms and conditions of the Incidental Take Statement that will accompany the biological opinion.

permit area.

At the DEIS stage, the Alternative 8 (Preferred) would have allowed the regulatory authority to prohibit mining of areas within the proposed permit area that are of such exceptional environmental value that any adverse mining-related impacts must be prohibited. In response to comments on the Proposed Rule, the final version of the Preferred Alternative does not include this authority. However, like the existing rules, this Alternative retains language intended to minimize adverse impacts to habitats of unusually high value to fish and wildlife.

ES.6 Comparison of all Alternatives Considered

In addition to the No Action Alternative and the Preferred Alternative, seven other Alternatives were analyzed in the FEIS. These Alternatives ranged from the most environmentally protective Alternative (Alternative 2) to Alternative 9, which would put the requirements of the 2008 SBZ rule back in place. Full descriptions of the Alternatives are contained in Chapter 2 of this FEIS. The following comparisons of the nine Alternatives by principal element provide the major similarities and differences between each of the Alternatives.

ES.7 Protection of the Hydrologic Balance Functional Group

ES.7.1.1 Baseline Data Collection and Analysis

ES.7.1.1.1 Biological Conditions

- The No Action Alternative (also Alternative 9) -- No requirement for baseline biological assessment;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Baseline biological conditions assessment required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.7.1.2 Hydrologic Conditions

ES.7.1.2.1 Water Quality

- The No Action Alternative (also Alternative 9) -- Limited water-quality sampling points and analytical constituents. At a minimum, the analytical suite for surface water and groundwater consists of the following: temperature, total suspended solids (only surface water), pH, specific conductance, total dissolved solids (TDS), total iron, and total manganese;
- Alternative 2 (also 3, 4, 5, and 6) -- Baseline water-quality data are required on all intermittent and perennial streams and a representative number of ephemeral streams. Twelve evenly spaced samples are required from a consecutive 12-month period. The analytical suite for surface water and groundwater consists of the following: temperature, total suspended solids (only surface water), aluminum, bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, (hot) acidity, alkalinity, pH, selenium, specific conductance, TDS, total iron, arsenic, zinc, copper, cadmium, ammonia, nitrogen, and total manganese;

- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – Baseline water-quality data are required on all intermittent and perennial streams. Twelve evenly spaced samples are required from a consecutive 12-month period, or with regulatory authority approval on a quarterly basis for 24 consecutive months. The analytical suite for surface water must include both total and dissolved fractions of the parameters. The parameters for both ground and surface water include the following, at a minimum: temperature, total suspended solids (only surface water), bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, (hot) acidity, alkalinity, pH, selenium, specific conductance, TDS, total (surface water only) and dissolved iron, total (surface water only) and dissolved manganese. Does not specifically require analysis of ammonia, arsenic, cadmium, copper, nitrogen, aluminum or zinc.

ES.7.2.2 Surface Water Flow and Groundwater Levels

- The No Action Alternative (also Alternatives 3, 5, 8 (Preferred) and 9) -- Discrete stream flow and groundwater levels measurements required. Twelve evenly spaced samples required over a consecutive 12-month period;
- Alternative 2 (also 4 and 6) -- Continuous stream flow and groundwater levels measurements required; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.7.1.2.3 Rainfall Measurements

- The No Action Alternative (also Alternative 9) -- No onsite rainfall measurements required;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Continuous on-site rainfall measurement requirements; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.7.1.2.4 Stream Hydrologic Form and Ecological Function

- The No Action Alternative (also Alternative 9) -- No documentation required of stream hydrologic form and ecological function;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) --Documentation of stream hydrologic form and ecological function required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.8 Monitoring During Mining and Reclamation

ES.8.1.1 Biological Monitoring

- The No Action Alternative (also Alternative 9) -- No requirements for monitoring of biological condition;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) --Annual monitoring of biological condition required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.8.1.1.2 Water-Quality Monitoring

- The No Action Alternative (also Alternative 9) -- Monitoring for limited suite of analytes [temperature, total suspended solids (only surface water), pH, specific conductance, TDS, total iron, and total manganese] and the regulatory authority can release operator from monitoring before bond release;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Quarterly monitoring until final bond; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.8.1.1.3 Rainfall Measurements

- The No Action Alternative (also Alternative 9) -- No requirement for on-site rainfall measurements;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Continuous on-site rainfall measurements required; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.8.1.1.4 Runoff Control Structures

- The No Action Alternative (also Alternative 9) -- Certification of drainage control structures not required;
- Alternative 2 (also 6) -- Inspect and certify surface runoff control structures by a professional engineer after every one-year return interval precipitation event;
- Alternative 3 (also 4, 5 and 8 (Preferred)) -- Inspect and certify surface runoff control structures by a professional engineer after every two-year return interval precipitation event; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.8.1.1.5 Regulatory Authority Hydrologic Data Review

- The No Action Alternative (also Alternative 9) -- No regularly scheduled hydrologic review required;
- Alternative 2 (also 3, 4, 5, and 6) -- Regulatory authority review of monitoring data at permit mid-term review and permit renewal;

- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative; and
- Alternative 8 (Preferred) – Regulatory authority review of monitoring data at three-year intervals.

ES.8.1.1.6 Definition of Material Damage to the Hydrologic Balance

- The No Action Alternative (also Alternatives 5, 6, 7 and 9) -- No national definition for material damage to the hydrologic balance. Regulatory authority discretion to determine material damage to the hydrologic balance criteria on case-by-case basis; and
- Alternative 2 (also 3 and 4) -- The term would be defined as any quantifiable adverse impact on the quality or quantity of surface water or groundwater or on the biological condition of intermittent and perennial streams that would preclude attainment or continuance of any designated surface-water use under sections 101(a) and 303(c) of the Clean Water Act or any existing or reasonably foreseeable use of surface water or groundwater outside the permit area. Includes areas overlying the underground workings of underground mines.
- Alternative 8 (Preferred) – Material damage to the hydrologic balance outside the permit area means an adverse impact, as determined in accordance with the rest of this definition, resulting from surface coal mining and reclamation operations, underground mining activities, or subsidence associated with underground mining activities, on the quality or quantity of surface water or groundwater, or on the biological condition of a perennial or intermittent stream. The determination of whether an adverse impact constitutes material damage to the hydrologic balance outside the permit area would be based on consideration of the baseline data and the following reasonably anticipated or actual effects of the operation:

  (1) Effects that cause or contribute to a violation of applicable state or tribal water quality standards or a state or federal water quality standard established for a surface water outside the permit area under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), or, for a surface water for which no water quality standard has been established, effects that cause or contribute to non-attainment of any premining use of surface water outside the permit area.
  (2) Effects that preclude a premining use of groundwater outside the permit area; or
  (3) Effects that result in a violation of the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.

ES.8.1.1.7 Evaluation Thresholds

- The No Action Alternative (also Alternatives 5, 6, and 9) -- No evaluation thresholds;
- Alternative 2 (also 3 and 4– Regulatory authority to develop evaluation thresholds that are less than the material damage to the hydrologic balance standards; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) - Regulatory authority to develop evaluation thresholds for critical parameters in consultation with the Clean Water Act authority.

ES.9 Activities In or Near Streams Functional Group

ES.9.1.1 Stream Definitions

- The No Action Alternative (also Alternatives 3, 5, 6 and 9) -- No change in ephemeral, intermittent, and perennial stream definitions;
- Alternative 2 -- The definitions of intermittent, ephemeral, and perennial would be functionally replaced; all waterways defined as Waters of the U.S. under the CWA would be protected under this Alternative;
- Alternative 4 -- Streams defined based on flow and physical characteristics;
- Alternative 7 -- Existing definitions are not changed except that watershed size is not used as criteria to define intermittent streams; requires coordination with CWA authority; and
- Alternative 8 (Preferred) -- Stream definitions are defined in a way to limit the scope of those terms to conveyances with channels that have a bed-and-bank configuration and an ordinary high water mark, consistent with the approach taken by the USACE in implementing section 404 of the Clean Water Act.

ES.9.1.1.2 Activities in or near Streams, including Excess Spoil and Coal Refuse

- The No Action Alternative -- Prohibits mining activities through or within 100 feet of intermittent or perennial streams unless it can be demonstrated that the activity would not cause or contribute to the violation of applicable state or federal water quality standards and would not adversely affect the water quantity and quality or other environmental resources of the stream;
- Alternative 2 -- Prohibits surface mining activities in or within 100 feet of perennial streams. Prohibit surface mining activities in or within 100 feet of intermittent streams unless the applicant demonstrates that the activity would not: (1) preclude premining stream uses; (2) have more than a minimal adverse impact on the premining biological condition of the stream segment; or (3) cause material damage to the hydrologic balance outside the permit area. Requires a 100 foot forested streamside vegetative corridor for previously forested areas (or other native species for non-forested areas) adjacent to ephemeral or intermittent streams;
- Alternative 2 also prohibits placement of excess spoil within 100 feet of an intermittent stream (excess spoil placement is allowed in or near ephemeral streams). Under Alternative 2 disposal of coal mine waste in or within 100 feet of an intermittent or ephemeral stream is allowed;
- Alternative 3 (also 4 and 5) -- Prohibits surface mining activities in or within 100 feet of intermittent and perennial streams unless the applicant demonstrates that the activity would not: (1) preclude premining stream uses; (2) have more than a minimal adverse impact on the premining biological condition of the stream segment; or (3) cause material damage to the hydrologic balance outside the permit area;
- Alternative 6 --Prohibits mining activities within 100 feet of intermittent or perennial streams unless it can be demonstrated that: (1) the ecological function of the stream would be protected or restored; (2) placement of excess spoil fill or coal mine waste would not result in a discharge of "toxic mine drainage" and long-term adverse impacts to the environmental resources of the stream (within the footprint of the fill) would be offset in the same or adjacent watershed through fish and wildlife enhancement commensurate with the potential direct adverse impact to the stream; (3) other proposed mining activities within the stream buffer, but not within the stream

itself would not adversely affect the water quantity and quality or other environmental resources of the stream; (4) a 100-foot streamside vegetative corridor would be required along the entire reach (including ephemeral streams) of any restored stream;

- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative;
- Alternative 8 (Preferred) – Prohibits mining activities within 100 feet of intermittent and perennial streams unless the applicant demonstrates that the proposed activity would meet specific criteria listed previously in Table ES.5-1; and
- Alternative 9 --Prohibits mining activities (other than construction of stream-channel diversions) within a perennial or intermittent stream unless the regulatory authority finds that avoiding disturbance of the stream is not reasonably possible.

Additionally,

- The No Action Alternative – Excess spoil minimization not expressly required by regulation;
- Alternative 2 (also 3, 4, 5, 6, 8 (Preferred) and 9) --The applicant must demonstrate that (1) the operation has been designed to minimize, to the extent possible, the volume of excess spoil that the operation would generate and (2) the designed maximum cumulative volume of all proposed excess spoil fills would be no larger than the capacity needed to accommodate the anticipated cumulative volume of excess spoil that the operation would generate; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

And also,

- The No Action Alternative (also 9) -- Durable rock fills may be constructed by end-dumping. Placement in streams is not expressly prohibited if all other applicable requirements are met;
- Alternative 2 (also 3, 4, 5, 6 and 8 (Preferred)) --The practice of “end-dumping” or creating a “durable rock fill” of fill material into streams is prohibited wherever a specific Alternative is applicable. In addition, daily monitoring and maintenance of daily log is required during fill construction; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.9.1.1.3 Mining Through Streams

- The No Action Alternative -- Allows diversion of intermittent and perennial streams upon regulatory authority finding that the diversion would not adversely affect the water quantity and quality and related environmental resources of the stream;
- Alternative 2 (also 4) -- No mining activities allowed in or within 100 feet of a perennial stream. Mining allowed through all intermittent streams upon demonstration by the applicant that the reclamation plan would achieve complete restoration of the hydrologic form and ecological function of all perennial and intermittent streams in accordance with standards established by CWA permitting authority and baseline conditions; additional performance bond required for stream restoration. All ephemeral streams must be restored in form;

- Alternative 3 (also 5, and 6) -- Mining allowed through all streams upon demonstration by the applicant that the reclamation plan would achieve complete restoration of the hydrologic form and ecological function of all perennial and intermittent streams in accordance with standards established by CWA permitting authority and baseline conditions; additional performance bond required for stream restoration. Ephemeral streams restored in form to the extent required by geomorphic reclamation;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative;
- Alternative 8 (Preferred) -- Requires restoration of both the hydrologic form and ecological function of intermittent and perennial streams that are mined through. Also requires establishment of postmining surface drainage pattern and stream-channel configuration that is similar to premining conditions, with certain exceptions; and
- Alternative 9 -- Requires that restored stream channels for perennial and intermittent streams be designed and constructed using natural channel design techniques to restore or approximate the premining characteristics of the original stream channel.

ES.10 AOC and AOC Variances Functional Group

ES.10.1.1 AOC Variances

ES.10.1.1.1 Mountaintop Removal Mining Operations

- The No Action Alternative (also 6, 7 and 9) – Achieve or support beneficial postmining land use; demonstrate equal or better land use. Assure investment in public facilities, and documentation of private financial capability to ensure completion. Requires demonstration that natural watercourses below lowest coal seam to be mined would not be damaged;
- Alternative 2 -- Prohibits all mountaintop removal mining operations (could require SMCRA amendment); and
- Alternative 3 (also 4 and 5) –Achieve or support beneficial postmining land use; demonstrate equal or better use. Requires implementation of the approved postmining land use prior to final bond release. Sufficient bond must be posted to ensure that, if the proposed postmining land use is not implemented, lands subject to the variance could be returned to approximate original contour. Requires assurance of investment in public facilities, and documentation of private financial capability to ensure completion. Requires demonstration that (1) no increase would occur in parameters of concern in discharges to surface or groundwater; (2) no change would occur in size or frequency of peak flow as compared to what would occur if the operator returned the site to approximate original contour; and (3) the total volume of flow during any season of the year would not vary (flooding potential cannot be altered). Requires demonstration that natural watercourses within the proposed permit and adjacent areas would not be damaged. If site was forested before permit application, then must return to forest and revegetate using native species except where inconsistent with the postmining land use.
- Alternative 8 (Preferred) – Same as Alternative 3 except that in the Preferred Alternative, the applicant is required to have substantially, and not fully, implemented the approved postmining land use prior to final bond release. In addition, OSMRE has removed the proposed requirement that the applicant post a bond in amount sufficient to ensure that, if the proposed postmining land

use is not implemented, lands subject to the variance could be returned to approximate original contour. All other demonstrations described above for Alternative 3 would still apply.

ES.10.1.1.2 AOC Variances for Steep-Slope Operations

- The No Action Alternative (also Alternatives 6, 7 and 9) -- Achieve/support beneficial postmining land use; demonstrate equal or better land use. Demonstrate that surface water flow in the watershed would be improved over premining conditions ***or*** conditions what would have existed had the area been returned to AOC. Total suspended solids or pollutants to surface and ground water must be reduced in a manner that improves existing uses or ecology, ***or*** that reduces flood hazards due to reduced peak flow. Total flow volume in every season must not vary so as to adversely affect ecology of surface water or existing or planned use of surface or ground water;
- Alternative 2 -- Prohibits all variances from requirement to return the mined area to its AOC (could require SMCRA amendment); and
- Alternative 3 (also 4 and 5) -- Must demonstrate that surface water flow in the watershed would be improved over premining conditions and conditions that would have existed had the areas been returned to AOC. Must demonstrate that the AOC variance would result in fewer impacts to aquatic ecology for the cumulative impact area than would occur if the site were returned to AOC. The AOC variance cannot result in any placement of excess spoil in an intermittent or perennial stream. The applicant must demonstrate that the proposed deviations from AOC are necessary and appropriate to achieve the postmining land use. The operator must post additional bond sufficient to ensure that, if the proposed postmining land use is not implemented, lands subject to the variance would be returned to AOC. If site was forested before permit application, then must return to forest and revegetate using native species except where inconsistent with the postmining land use.
- Alternative 8 (Preferred) – Same as Alternative 3 except that in the Preferred Alternative OSMRE has removed the requirement for the operator to post additional bond sufficient to ensure that lands approved for a variance from AOC can be returned to AOC if the proposed postmining land use is not implemented.

ES.10.1.2 Surface Configuration and Fills

ES.10.1.2.1 Definition of AOC

- The No Action Alternative (also Alternatives 6 and 9) -- Definition of AOC would not change, includes backfilling and restoring disturbed areas to *closely resemble* premining topography;
- Alternative 2 (also 3, 4, and 5) -- Definition of AOC same as the No Action Alternative with the additional requirement that surface configuration achieved by backfilling and grading of the mined area be documented by landform measurements and analyses conducted before, during, and after mining and reclamation; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – AOC means that surface configuration achieved by backfilling and grading of the mined area so that the reclaimed area closely resembles the general surface configuration of the land within the permit area prior to any mining activities or related disturbances and blends into and complements the drainage pattern of the surrounding terrain.

All highwalls and spoil piles must be eliminated to meet the terms of the definition, but that requirement does not prohibit the approval of terracing, the retention of access roads or the approval of permanent water impoundments. For purposes of this definition, the term "mined area" does not include excess spoil fills and coal refuse piles.

ES.10.1.2.2 Digital Terrain Analysis

- The No Action Alternative (also Alternatives 6, 8 (Preferred) and 9)-- Digital terrain analysis not required, requires mine plans to address postmining land use but introduces no new specific requirements for terrain analysis;
- Alternative 2 (also 3, 4, and 5)-- Requires use of digital terrain models during premining and backfilling to confirm premining topography, and adherence to the reclamation plan for backfilling except that remining sites and contiguous permits 40 acres or less are exempt; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.10.1.2.3 Permanent Impoundments and Final Elevations

- The No Action Alternative (also Alternative 3, 6, 8 (Preferred) and 9) -- No limits placed on final elevations. Still allows permanent impoundments, including final-cut impoundments provided they do not conflict with achieving AOC and they meet the postmining land use requirements. No requirements to use landforming principles during reclamation.
- Alternative 2 (also 4) -- Allowable deviation in the elevation of the backfilled and graded area postmining in comparison to the premining elevation based on the lowest coal seam mined. The allowable deviation in the postmining elevation could be no more than ±20 percent of the difference between the premining surface elevation and the premining bottom elevation of that lowest coal seam, with allowances for slope stability and minor shifts in the location of premining features. Allows exceedance of 20 percent tolerance to minimize excess spoil generation. In addition, tolerance requirement does not apply to that portion of the permit where steep-slope contour mining is conducted. Requires use of landforming principles (geomorphic reclamation). Still allows permanent impoundments, including final-cut impoundments provided they do not conflict with achieving AOC and they meet the postmining land use requirements;
- Alternative 5 – Same as the No Action Alternative except that it requires return of as much as spoil material to the mined area as possible (including transport of spoil above the original contour), and that it prohibits flat decks on excess spoil fills and coal refuse facilities; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements (other than steep slope conditions) apply, otherwise same as the No Action Alternative. This Alternative does not require compliance with the ±20 percent tolerance because stability and equipment constraints make it impracticable to impose this requirement on contour mining on steep slopes (defined as slopes greater than 20 degrees).

ES.10.1.3 Revegetation, Topsoil, and Fish and Wildlife Functional Group

ES.10.1.3.1 Revegetation

- The No Action Alternative (also Alternatives 6 and 9) -- Vegetative cover in accordance with the approved permit and reclamation plan, comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use;
- Alternative 2 (also 3, 4, and 5) -- Requires that all reclaimed lands be revegetated with native species unless the postmining land use is actually implemented before the end of the revegetation responsibility period;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – Requires the use of native pollinator-friendly plants and planting arrangements that promote the establishment of pollinator-friendly habitat when practicable. The revegetation plan must create a diverse permanent vegetative cover that is consistent with native plant communities, and the species used must themselves be native with limited exceptions for temporary ground cover and certain postmining land uses.

ES.10.1.3.2 Topsoil management

- The No Action Alternative (also Alternatives 6 and 9) -- Requires salvage and redistribution of all topsoil (A and E soil horizons) or the top 6 inches of soil material if less than that thickness of topsoil is present. Salvage and redistribution of the B and C soil horizons is at the discretion of the regulatory authority (except on prime farmland, where it is mandatory). Selected overburden materials may be substituted for, or used as a supplement to topsoil if the operator demonstrates to the regulatory authority that: (1) the resulting soil medium is equal to, or more suitable for sustaining vegetation than, the existing topsoil; and (2) the resulting soil medium is the best available in the permit area to support revegetation;
- Alternatives 2 (also 3, 4, 5 and 8 (Preferred)) -- Requires salvage and redistribution of all topsoil (A and E soil horizons). Also requires salvage and redistribution of the B and C soil horizons (or other suitable overburden materials) to the extent necessary to achieve a growing medium with the optimal rooting depths required to restore premining land use capability or comply with revegetation requirements. Allows use of selected overburden materials as substitutes for (or supplements to) either topsoil or subsoil or both if the operator demonstrates that either (1) the quality of the existing topsoil and subsoil is inferior to that of other overburden materials or (2) the quantity of the existing topsoil and subsoil is insufficient to provide the optimal rooting depth or meet other plant growth requirements. In the latter case, all existing topsoil and favorable subsoil must be salvaged and redistributed. The operator also must demonstrate that the resulting soil medium would be more suitable than the existing topsoil and subsoil to sustain vegetation and that the selected overburden materials are the best available within the permit area for that purpose. The operator would have to redistribute soils in a manner that limits compaction, and provides optimal rooting depth to support the approved plan for revegetation and reforestation; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.10.1.3.3 Salvage and Redistribution of Organic Materials

- The No Action Alternative (also Alternatives 6 and 9) -- Does not require salvage and redistribution or reuse of organic materials (duff, other organic litter, and vegetative materials such as tree tops, small logs and root balls) above the A soil horizon;
- Alternative 2 (also 4) -- Requires salvage and redistribution or reuse of ***all*** vegetative organic materials above the A soil horizon to promote reestablishment of locally adapted and genetically diverse native vegetation and soil flora and fauna and to enhance fish and wildlife habitats. Prohibits burning or burying of vegetation or other organic materials;
- Alternatives 3 (also 5) -- Requires salvage and redistribution of materials from native vegetation only (not from all vegetation) above the A soil horizon root balls in accordance with an approved plan developed by a qualified ecologist or similar expert who would determine the amounts needed to promote reestablishment of native vegetation and soil flora and fauna. Prohibits burning of above ground debris from native vegetation. Organic materials not needed for the approved plan may be used to construct fish and wildlife enhancement features;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative; and
- Alternative 8 (Preferred) – Same as Alternative 3 except that it creates a limited exception to the requirement for salvage and redistribution or other use of organic matter. The Preferred Alternative also requires that organic matter from invasive species be buried rather than salvaged and redistributed.

ES.10.1.3.4 Reforestation

- The No Action Alternative (also Alternatives 6 and 9) -- Lands that have returned to forest through natural succession classified as "undeveloped" are not required to be reforested;
- Alternative 2 (also 3, 4, 5 and 8 (Preferred)) -- Requires reforestation of previously forested areas and of lands that would revert to forest under conditions of natural succession (except for prime farmland historically used for cropland) in a manner that would enhance recovery of the native forest ecosystem as expeditiously as possible; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.10.1.3.5 Fish and Wildlife Protection and Enhancement

ES.10.1.3.5.1 Enhancement of Fish and Wildlife

- The No Action Alternative (also Alternative 9) -- Achieve enhancement of fish and wildlife resources where practicable. Surface mining activities must enhance where practicable, or restore, habitats of unusually high value for fish and wildlife;
- Alternative 2--Enhancement required if mitigation required pursuant to the CWA. CWA mitigation incorporated as a condition of the SMCRA permit. Bond release on the SMCRA permit would be conditioned on successful mitigation as determined by the regulatory authority and the agency implementing the CWA. This option may require an amendment of SMCRA;
- Alternative 3 (also 4, 5, and 6) -- Enhancement measures would be mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant

communities, or filling of a segment of a perennial or intermittent stream (but not ephemeral streams). Resource enhancement must be: (1) commensurate with long-term adverse impact to affected resources; and (2) be located in the same or nearest adjacent watershed as the proposed operation if there are no opportunities for enhancement within the same watershed, and be on permitted area. Mining of certain areas within the permit area with exceptional environmental value may be prohibited by regulatory authority;

- Alternative 7 – Same as Alternative 3 when enhanced permitting requirements apply, otherwise same as the No Action Alternative; and
- Alternative 8 (Preferred) -- Same as Alternative 3 except that it does not include provision for prohibiting mining on areas of exceptional environmental value within the permit area.

ES.10.1.3.5.2 Endangered and Threatened Species Protection

- The No Action Alternative (also Alternatives 6 and 9) -- No surface mining activity can be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary or which is likely to result in the destruction or adverse modification of designated critical habitat of such species in violation of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.)*;
- Alternative 2 (also 3, 4, and 5) -- Same as Alternatives 1 and 6, in addition would (1) codify the dispute resolution provisions of the biological opinion concerning protection of threatened and endangered species and (2) add a provision to the regulations expressly requiring that the fish and wildlife protection and enhancement plan in the permit application include any species-specific protection and enhancement plans developed in accordance with the Endangered Species Act and any biological opinions implementing that law; and
- Alternative 7 – Same as Alternative 2 where enhanced permitting conditions apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – The "adjacent area" includes those areas outside the proposed or actual permit area where surface coal mining operations or underground mining activities may affect a species listed or proposed for listing as endangered or threatened under that Act or designated or proposed critical habitat under that Act. Requires that the applicant document that the proposed operation would have no effect on species listed or proposed for listing as threatened or endangered or on designated or proposed critical habitat; or documentation of consultation on impacts and planned compliance with terms and conditions resulting from consultation. Does not codify the dispute resolution procedures but instead addresses them through the SPR biological opinion and the ESA MOU between OSMRE and the U.S. FWS.

ES.10.1.3.5.3 Streamside Vegetative Corridors

- The No Action Alternative (also Alternative 9) -- The operator must avoid disturbances to, enhance where practicable, restore, or replace, wetlands, and riparian vegetation along rivers and streams and bordering ponds and lakes;
- Alternative 2 (also 5, 6 and 8 (Preferred)) -- Requires creation of a 100-foot streamside vegetative corridor, comprised of native non-invasive species, to enhance restoration of the ecological function of ephemeral, intermittent, or perennial streams. The streamside vegetative corridor must be established along the entire reach of any stream restored or permanently diverted;

- Alternative 3 (also 4) -- Requires establishment of a 300-foot streamside vegetative corridor comprised of native woody species along restored or permanently diverted intermittent and perennial streams, if the land would naturally revert to forest under natural succession (not required if this would conflict with the approved postmining land use); and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

ES.11 Alternatives Considered but not Carried Forward

Three other distinct Alternatives were also considered, but OSMRE ultimately determined that they did not adequately meet the purpose and need and therefore did not carry them forward for further analysis in the FEIS. These Alternatives included an Alternative that would prohibit mining activities (including placement of excess spoil) in or near streams and mining through all streams and that would limit backfilling elevation to a maximum ±10 percent elevation deviation from the original elevation was considered. The results of the preliminary analysis indicated that this threshold was not realistic and OSMRE instead incorporated a ±20 percent elevation threshold into Alternatives 2, 4 and 7.

Another Alternative that would absolutely prohibit all surface coal mining and reclamation activities, including fill placement and coal mine waste, in or within 100 feet of all streams, including ephemeral streams was also considered. The results of the preliminary analysis indicated that implementation of this Alternative would result in a significant reduction in coal recovery in five of the seven coal-producing regions. OSMRE determined that the impacts to coal production from this Alternative were so substantial that they ran counter to the mandate under SMCRA 102(f) to balance the need for energy with the protection of the environment. While the prohibition would provide maximum protection for streams, it would result in an unacceptable impact on the nation’s energy production via coal. For this reason, OSMRE determined that this Alternative did not fall within the range of reasonable Alternatives that could achieve the purpose of this proposed action, and dismissed this Alternative from further consideration.

Finally, an Alternative that would define material damage to the hydrologic balance outside the permit area based on a percentage of the watershed impacted by any one coal mining operation was considered. Once that percentage of the watershed had been impacted by coal mining activities, no additional mining could be permitted in those watersheds. Although it would prohibit further impacts in already impacted watersheds, this Alternative would greatly restrict the ability to mine coal in areas of the country that produce a sizeable percentage of the Nation’s coal. The preliminary analysis indicated that this Alternative would significantly affect the ability to mine coal in three of the highest coal-producing counties in West Virginia and over half of currently mined watersheds in the Powder River Basin. Additionally, this Alternative would impose these impacts on coal production based on an acreage threshold that has not been scientifically determined to be a suitable nationwide basis for determining the likelihood or extent of material damage to the hydrologic balance. For these reasons, OSMRE determined that this Alternative was not scientifically justifiable, and did not meet the purpose of the proposed action.

ES.12 Impacts of the Alternatives

The FEIS examined each of the Alternatives carried forward, including the No Action Alternative, to determine the potential for each Alternative to impact resources within the human environment. The resources addressed in the EIS include the following:

- Mineral Resources and Mining;
- Physical Resources (including water resources; topography, geology and soils; air quality, greenhouse gas emissions and climate change);
- Biological Resources;
- Social, Cultural, and Economic Resources (including socioeconomic conditions; land use; utilities; infrastructure; historic and archaeological resources, visual resources; noise; recreation; and public health and safety); and
- Environmental Justice.

The effects of each Alternative on these resources were analyzed within the seven primary coal-bearing regions of the United States.

Under the No Action Alternative, coal mining would continue to be conducted under existing regulations and all impacts associated with mining under these regulations would continue.

ES.12.1.1 Summarized Impacts of the Alternatives

Impacts of the Action Alternatives would generally include adverse effects on socio-economic resources and positive effects on the other resource categories. The EIS defines categories of impacts using classes ranging from “Major Adverse” through “Negligible” to “Major Beneficial” to assist the reader in putting the impacts and results into context. These impacts are determined by comparing anticipated effects of an Action Alternative with the anticipated effects of the No Action Alternative (the baseline), for the study period (2020 to 2040). In general, Alternative 2 has the most strongly adverse impacts, which are anticipated for socioeconomic conditions, as well as the most strongly beneficial impacts, which occur for most other resources, when compared to impacts of the No Action Alternative. Alternative 9 shows Negligible impacts when compared to impacts of the No Action Alternative. Remaining Action Alternatives exhibit the same pattern of impacts as Alternative 2, but with varying degrees of adverse effects on socioeconomic conditions and benefits to natural resources. The following sections summarize the results of the analysis by resource in more detail.

ES.12.1.1.1 Water Resources

Under the No Action Alternative, mining practices would remain unchanged and no further regulations or corrective measures in addition to those already in place would be implemented. Consequently, the impact of surface and underground mining operations would continue to produce adverse effects on water resources outside the permit area. Some examples of the impacts of mining include, but are not limited to, reduced stream and groundwater pH from acid mine drainage; elevated concentrations of iron, aluminum, manganese, and sulfate in surface water; increased sedimentation in the water column; flow alteration and stream elimination as a result of mining through streams and spoil management practices; drawdown of groundwater levels; and degradation of groundwater through increased concentrations of sulfate, iron, and other pollutants (see Subsection 4.2.1.1).

Consistent with the intent of the regulations to reduce adverse impacts of mining activities on perennial and intermittent streams, the Action Alternatives (except Alternative 9) would result in benefits to water resources relative to the No Action Alternative at the national scale. In particular, the analysis finds that Action Alternatives would result in Major Beneficial impacts to water resources under Alternatives 2, 3, 4, and 8 (Preferred) at the national scale. Moderate Beneficial impacts to water resources would be expected under Alternatives 6 and 7, with Minor Beneficial impacts under Alternative 5 at the national scale. Alternative 9 is anticipated to be functionally similar to the No Action Alternative and is anticipated to result in Negligible effects on water resources.

On a regional scale, Major Beneficial impacts are anticipated in the Appalachian Basin and Illinois Basin under Alternatives 2, 3, 4, and 8 (Preferred). Moderate Beneficial impacts are anticipated in the Appalachian Basin for Alternatives 5, 6, and 7, in the Illinois Basin for Alternatives 6 and 7, and in the Colorado Plateau, Gulf Coast, and Northern Rocky Mountains and Great Plains regions for Alternatives 2, 3, 4, 6, 7, and 8 (Preferred). Other effects on water resources are anticipated to be Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.2 Biological Resources

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in biological resources would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of ongoing coal mining activities on biological resources under the No Action Alternative.

Action Alternatives are generally anticipated to benefit biological resources at the national scale when compared to the No Action Alternative, with Alternatives 2, 3, 4, 7, and 8 (Preferred) providing Moderate Beneficial impacts, and Alternatives 5 and 6 providing Minor Beneficial impacts at a national scale. Alternative 9 is anticipated to be functionally similar to the No Action Alternative and is anticipated to result in Negligible effects on biological resources.

On a regional scale, and similarly to water resources, Major Beneficial impacts are anticipated in the Appalachian Basin and the Illinois Basin under Alternatives 2, 3, 4, and 8 (Preferred). Major Beneficial impacts are also anticipated in the Appalachian Basin under Alternative 5. Moderate Beneficial impacts are anticipated in the Colorado Plateau, Gulf Coast, and Northern Rocky Mountains and Great Plains regions under Alternatives 2, 3, 4, 7, and 8 (Preferred). Moderate Beneficial impacts are also anticipated in the Appalachian Basin and the Illinois Basin under Alternative 7. Other effects on biological resources are anticipated to be Minor Beneficial or Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.3 Topography, Geology, and Soils

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in geology, soils, and topography would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives

(i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of ongoing geology, soils, and topography under the No Action Alternative.

Action Alternatives are generally anticipated to benefit topography, geology, and soils when compared to the No Action Alternative, with Minor Beneficial impacts anticipated for Alternatives 2, 3, 4, 5, 7, and 8 (Preferred). Alternatives 6 and 9 are anticipated to result in Negligible effects on topography, geology, and soils at a national scale.

On a regional scale, Moderate Beneficial impacts are anticipated in the Appalachian Basin under Alternatives 2, 4, 5, 7, and 8 (Preferred). Other effects on topography, geology, and soils resources are anticipated to be Minor Beneficial or Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.4 Air Quality, Greenhouse Gas Emissions, and Climate Change

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in air quality, greenhouse gas emission, and climate change would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of air impacts associated with coal mining activities under the No Action Alternative.

While, none of the Action Alternatives explicitly targets air quality resources, implementation of the elements of the Action Alternatives may have both beneficial and adverse effects on air quality and greenhouse gas emissions. The predominant effect of the rule on air quality and greenhouse gas emissions that is quantified in this EIS is the reduction in carbon dioxide (CO_2) emissions associated with the overall reduction in coal activity due to increased costs of coal production. Even accounting for increased energy generation from substitute sources (primarily natural gas), the Action Alternatives would generate a net reduction in greenhouse gas emissions over the timeframe of the analysis. The monetary value of this benefit reflects the anticipated effect of marginal reductions in emissions on a wide range of climate-related impacts, such as agricultural productivity, human health, and property damage from flooding. Additionally, the Action Alternatives may increase the terrestrial carbon sequestration potential of the landscape during and post-mining activities due to the reforestation and streamside vegetative corridor requirements of the Action Alternatives (except for Alternative 9), further generating reductions in climate-related damages. On the other hand, the Action Alternatives may also increase the use of equipment and vehicles to haul materials and therefore increase greenhouse gas emissions from these sources.

In contrast to the other categories of environmental and economic impacts evaluated in this analysis, the benefits of reduced greenhouse gas emissions represent worldwide climate-related damages, independent of the geographic source of the emissions. This analysis accordingly considers the magnitude of these benefits, finding that the effects are beneficial across all Action Alternatives.

ES.12.1.1.5 Socioeconomic Conditions

The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). In particular, the Colorado Plateau, Appalachian Basin, and Northern Rocky Mountain and Great Plains regions are forecasted to have the largest production decreases in coal production, respectively. This reduction in production would be expected to have adverse impacts on localized socioeconomics conditions, to the extent that reductions in coal production also reduce coal mining employment and associated income. In 2014, coal mining accounted for 0.06 percent of national employment and 0.1 percent of national income (U.S. Census Bureau, 2014; U.S. EIA, 2016a). EIA estimates that 2014 coal industry employment was approximately 75,000 employees (U.S. EIA, 2016a). This analysis projects that coal industry employment will decrease by over 7,000 full-time equivalents (FTEs) under baseline conditions from 2020 to 2040. This decrease in employment demand over the analysis period in the No Action Alternative is consistent with the projected declining demand for U.S. coal from retiring coal-fired power plants and is expected to occur primarily in the Appalachian Basin, the Illinois Basin, and the Northern Rocky Mountains and Great Plains regions.

At the national scale, Alternative 2 is anticipated to result in Moderate Adverse impacts on socioeconomic conditions including, in particular, employment and severance taxes when compared to the No Action Alternative. Alternatives 3, 4, 5, 6, 7, and 8 (Preferred) are anticipated to result in Minor Adverse impacts on socioeconomic conditions, including employment, and severance taxes at the national scale. Alternative 9 is anticipated to be functionally similar to the No Action Alternative and is anticipated to result in Negligible effects on socioeconomic conditions.

To the extent that impacts of the Action Alternatives are concentrated in a particular community, these communities may experience a reduced quality of life to the extent that the Action Alternatives result in reduced mining activity. In addition, coal companies may have a philanthropic presence in communities; reduced mining could adversely affect these philanthropic activities. Depending on the severity of the observed changes, declining quality of life in coal-dependent communities could lead to population declines in those communities.

At a regional scale, Major Adverse impacts on socioeconomic conditions, including employment, are anticipated in the Appalachian Basin under Alternative 2. Moderate Adverse impacts on socioeconomic conditions are anticipated in the Appalachian Basin under Alternatives 3, 4, 5, 7, and 8 (Preferred). Impacts to other regions to socioeconomic conditions are anticipated to be Minor Adverse or Negligible across Alternatives at the regional scale when compared to the No Action Alternative. The following summary of expected effects helps to illustrate anticipated adverse impacts:

- Under Alternative 2, annual impacts to production-related employment are expected to range from a reduction in demand for 854 FTEs to a reduction of 28 across all regions, with an average reduction in annual demand of 270 FTEs.[16] Annual impacts to industry implementation-related

[16] The range of annual impacts to employment represents the minimum and maximum effect in any year in the study period. The average effect is the average annual effect on employment of the Alternative over the 21 year study period.

employment are expected to range from a gain of 525 FTEs to a gain of 686 across all regions, with an average increase in annual demand of 620 FTEs;

- Under Alternative 3, annual impacts to production-related employment are expected to range from a reduction in demand for 654 FTEs to a reduction of two across all regions, with an average reduction in annual demand of 178 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 360 FTEs to a gain of 460 across all regions, with an average increase in annual demand of 419 FTEs;
- Under Alternative 4, annual impacts to production-related employment are expected to range from a reduction in demand for 579 FTEs to a reduction of 11 across all regions, with an average reduction in annual demand of 154 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 88 FTEs to a gain of 124 across all regions, with an average increase in annual demand of 105 FTEs;
- Under Alternative 5, annual impacts to production-related employment are expected to range from a reduction in demand for 388 FTEs to a reduction of five across all regions, with an average reduction in annual demand of 99 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 164 FTEs to a gain of 212 across all regions, with an average increase in annual demand of 193 FTEs;
- Under Alternative 6, annual impacts to production-related employment are expected to range from a reduction in demand for 335 FTEs to a reduction of seven across all regions, with an average reduction in annual demand of 86 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 227 FTEs to a gain of 315 across all regions, with an average increase in annual demand of 272 FTEs;
- Under Alternative 7, annual impacts to production-related employment are expected to range from a reduction in demand for 580 FTEs to a gain of one across all regions, with an average reduction in annual demand of 169 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 215 FTEs to a gain of 275 across all regions, with an average increase in annual demand of 252 FTEs;
- Under Alternative 8 (Preferred), annual impacts to production-related employment are expected to range from a reduction in demand for 511 FTEs to a reduction of three across all regions, with an average reduction in annual demand of 124 FTEs. Annual impacts to industry implementation-related employment are expected to range from a gain of 240 FTEs to a gain of 309 across all regions, with an average increase in annual demand of 280 FTEs; and
- Under Alternative 9, no changes in either production-related or industry implementation-related annual employment are expected.

ES.12.1.1.6 Land Use, Utilities, Infrastructure, Visual Resources, and Noise

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in land use, utilities, infrastructure, visual resources, and noise would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of ongoing coal mining activities on land uses under the No Action Alternative.

Reduced coal production would reduce adverse impacts to land use, reduce demands on utilities, and infrastructure, reduce adverse impacts to visual resources, and reduce noise in coal mining regions that would have otherwise occurred under the No Action Alternative. Alternative 2 is anticipated to result in Minor Beneficial results to land use, utilities, infrastructure, visual resources, and noise at the national scale when compared to the No Action Alternative. Other Alternatives are anticipated to result in Negligible impacts at the national scale.

At a regional scale, Moderate Beneficial impacts to land use, utilities, infrastructure, visual resources, and noise are anticipated in the Appalachian Basin under Alternative 2, 3, 4, 5, 7, and 8 (Preferred). Other effects on land use, utilities, infrastructure, visual resources, and noise are anticipated to be Minor Beneficial or Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.7 Public Health and Safety

Water and air quality are primary drivers of public health changes in coal mining regions. Arsenic, selenium, and sulfates are drinking water contaminants found to be elevated near mining regions. Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing public health and safety trends would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of ongoing coal mining activities on water resources under the No Action Alternative.

At the national scale, Alternatives 2, 3, 4, and 8 (Preferred) are anticipated to result in Major Beneficial impacts to public health and safety when compared to the No Action Alternative. Alternatives 6 and 7 are anticipated to result in Moderate Beneficial impacts to public health and safety. Alternative 5 is anticipated to result in Minor Beneficial impacts to public health and safety at the national scale. Alternative 9 is anticipated to be functionally similar to the No Action Alternative and is anticipated to result in Negligible effects on public health and safety.

At a regional scale, Major Beneficial impacts are anticipated in the Appalachian Basin and Illinois Basin regions under Alternatives 2, 3, 4, and 8 (Preferred). Major Beneficial impacts are also anticipated in the Appalachian Basin under Alternative 7. Moderate Beneficial impacts are expected in the Colorado Plateau, Gulf Coast, and Northern Rocky Mountains and Great Plains regions under Alternatives 2, 3, 4, 6, 7, and 8 (Preferred). Moderate Beneficial impacts are also anticipated in the Appalachian Basin for Alternatives 5 and 6, and in the Illinois Basin for Alternatives 6 and 7. Other effects on public health and safety are anticipated to be Minor Beneficial or Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.8 Archaeology, Paleontology, and Cultural Resources

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in archaeology, paleontology and cultural resources would continue. For example, adverse effects to cultural resources that occur as part of development activities would continue under the No Action. Under the No Action Alternative, a fairly stringent set of regulations are in place which attempt to avert and mitigate impacts to these resources where they occur.

Nationally, all Action Alternatives are expected to have Negligible impacts on Archaeology, Paleontology, and Cultural Resources. At a regional level, Negligible impacts are expected in all regions under all Alternatives. To the extent that any particular rule element reduces the extent of ground disturbance associated with mining, it would also reduce the disturbance of cultural resources located within that area. Therefore, cultural resources may benefit from some or all of the rule elements.

ES.12.1.1.9 Recreation

Recreational activities, including hunting, wildlife viewing, trail use, boating, and fishing, may occur on both public and private lands within the study area. Public lands, including federal, state, and locally managed lands, are often popular destinations for recreators due to the relatively natural and undeveloped quality of those lands. In addition, private lands are also used for recreation. Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in recreation would continue. The annual quantity of coal demanded and associated production is anticipated to be approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative). This reduction in production would reduce adverse impacts of ongoing coal mining activities on recreational activities under the No Action Alternative.

At the national scale, Alternative 2 is anticipated to result in Moderate Beneficial impacts to recreational activities when compared to the No Action Alternative. Alternatives 3, 4, 5, 6, 7, and 8 (Preferred) are anticipated to result in Minor Beneficial impacts to recreation. Alternative 9 is anticipated to be functionally similar to the No Action Alternative and is anticipated to result in Negligible effects on recreational activities.

At a regional scale, Major Beneficial impacts are anticipated in the Appalachian Basin under Alternative 2. Moderate Beneficial impacts are anticipated in the Appalachian Basin region under Alternatives 3, 4, 5, 7, and 8 (Preferred) and in the Colorado Plateau region under Alternatives 2, 3, 4, 7, and 8 (Preferred). Other effects on to recreational activities are anticipated to be Minor Beneficial or Negligible at the regional scale when compared to the No Action Alternative.

ES.12.1.1.10 Environmental Justice

Environmental justice communities are those that meet the defined environmental justice criteria for minority, low-income, and American Indian populations. The environmental justice evaluation discusses the potential impacts of the Action Alternatives on these populations, including impacts on socioeconomic resources, public health and safety, biological resources, water resources, air quality, topography, land use, and recreation.

The affected area for this analysis is large and spans a variety of demographic conditions. In total, the affected area intersects with 286 counties in 24 states. The analysis was conducted at a county level to determine if any of the 286 counties contain populations that meet environmental justice criteria. Indian tribes are considered as a distinct category in the minority population environmental justice analysis.

Under the No Action Alternative, no further regulations or corrective measures in addition to those already in place would be implemented. Therefore, ongoing trends in the evaluated resources would continue. The annual quantity of coal demanded and associated production is anticipated to be

approximately 10 percent lower in 2040 than in 2020, even without implementation of the Alternatives (i.e., under the No Action Alternative).

Of the 286 counties in the study area, there are 190 counties that have populations that meet the previously specified low income and/or the minority population environmental justice thresholds. Of these 190 counties, 60 percent of them are in the Appalachian Basin. Of those counties in the Appalachian Basin, four have been identified as minority communities, 103 as low income communities, and nine as both low income and minority environmental justice communities. The minority communities identified as potentially affected environmental justice populations in this region are as follows: Black or African American; American Indian and Alaskan Native; Asian, Native Hawaiian or Other Pacific Islander; Hispanic Origin; and Other.

There were six counties in the Colorado Plateau identified as potentially affected low income populations and four counties identified as both low income and minority environmental justice communities. Minority populations included American Indian and Alaskan Native. In the Gulf Coast region, three counties had populations that met the criteria for environmental justice low income and minority populations, 11 counties were identified as only low income communities, and one county was identified as a minority community (Black or African American, American Indian and Alaskan Native, and Hispanic Origin).

In the Illinois Basin, 28 counties met the criteria for low income populations and three counties met environmental justice thresholds for both low-income and minority populations (Black or African American; and American Indian and Alaskan Native). In the Northern Rocky Mountains and Great Plains region, three counties were identified as minority communities, six as low income communities, and four as both low income and minority environmental justice communities. The minority communities identified as potentially affected environmental justice populations in this region are as follows: American Indian and Alaskan Native; Hispanic Origin; and Other. In the Northwest, one county was identified as a low income environmental justice community. In the Western Interior, one county was identified as both low income community and minority population. Six counties met environmental justice low income population thresholds only and two counties met minority population thresholds only. Three counties identified for minority populations met environmental justice criteria for American Indian and Alaskan Native minority populations. One of the counties also has minority populations of Asian, Native Hawaiian or Other Pacific Islander and Other that meet environmental justice criteria.

Mining occurs in close proximity to or on a number of tribal reservations. The Northern Cheyenne Indian Reservation is situated in both Big Horn and Rosebud Counties in Montana where five active surface mines exist. In addition, the Crow Indian Reservation covers nearly 65 percent of Big Horn County. San Juan County overlaps both the Navajo Nation Reservation and the Ute Mountain Reservation where one active surface mine and one active underground mine exist. The Zuni Reservation is located primarily in McKinley County where two active surface mines exist. McKinley County also overlaps with the Navajo Nation Reservation. Navajo County in Arizona is comprised of the Navajo Nation Reservation, the Fort Apache Reservation, and the Hopi Reservation where one active surface mine exists.

Of particular note are mines located on (not just near) tribal land. For example, the Navajo Mine and the Kayenta Mine are operated on the Navajo Nation lands and produce about 15 million tons of coal annually (U.S. EIA, 2012c). An additional coal mine, the Absaloka Mine, is located on the Crow Reservation in Montana.

At the regional scale, adverse impacts to socioeconomic resources associated with environmental justice communities are expected to occur as follows:

- Under Alternatives 2, 3, 6, 7 and 8 (Preferred): the Appalachian Basin, Illinois Basin, and Northern Rocky Mountains and Great Plains are expected to incur adverse socioeconomic effects; Negligible effects are expected for all other regions. In the Appalachian Basin, 103 counties have populations that meet the criteria for low-income environmental justice communities and four for minority populations, with nine counties falling into both categories. In the Illinois Basin, four counties have an American Indian and Alaskan Native environmental justice population. In seven counties in the Northern Rocky Mountains and Great Plains region there are three environmental justice minority populations: Asian, Native Hawaiian, Pacific Islander, or Other; Hispanic Origin; and Other. Negligible effects on socioeconomic conditions are expected for all other regions.
- Under Alternative 4: the Appalachian Basin and Illinois Basin are expected to incur Moderate and Minor Adverse socioeconomic effects. In the Appalachian Basin, 103 counties have populations that meet the criteria for low-income environmental justice communities and four for minority populations, with nine counties falling into both categories. In the Illinois Basin, four counties have an American Indian and Alaskan Native environmental justice population. The Northern Rocky Mountains and Great Plains region is expected to experience Minor Beneficial socioeconomic effects. Negligible effects on socioeconomic conditions are expected for all other regions.
- Under Alternative 5: the Appalachian Basin is expected to incur Moderate Adverse Socioeconomic effects. In the Appalachian Basin, 103 counties have populations that meet the criteria for low-income environmental justice communities, four meet the criteria for minority populations, and nine counties fall into both categories. Minor Adverse socioeconomic effects are expected in the Northern Rocky Mountains and Great Plains region, and there are three environmental justice minority populations in that region (as mentioned previously). Negligible effects on socioeconomic conditions are expected for all other regions.
- Under Alternative 9: Negligible effects on socioeconomic conditions are expected for all regions.

At the regional scale, impacts to resources other than socioeconomics for environmental justice communities are expected to be Negligible or beneficial.

ES.12.2.1 Summarized Impacts of the No Action Alternative

Impacts of the No Action Alternative are discussed for each resource in the EIS. The categories used above describe a result, i.e. a predicted beneficial or adverse effect that is different upon implementation of the Alternative being considered in relation to the effects that are expected to occur under the No Action Alternative. A determination of impacts of the No Action Alternative is therefore "No Effect" under this analytical framework (as the No Action Alternative is compared to itself). The FEIS provides

detailed qualitative discussions of the impacts of mining under the current regulations especially as documented in scientific research and through the experience of the regulatory authorities.

ES.12.2.1.1 Summarized Benefits of the Preferred Alternative

All of the Action Alternatives (excluding Alternative 9) would have beneficial, long-term effects on resources, except for socioeconomic resources, to varying degrees by Alternative and region. Alternative 8 (Preferred), throughout the planning process and as revised since the DEIS, incorporates measure to minimize impacts to socioeconomic resources and would have a number of important benefits in comparison to the No Action Alternative. Implementation of the Preferred Alternative would do the following:

- Improve permitting processes and make it easier for the regulatory authority to determine whether mine plans are designed in accordance with the regulatory program. It would also improve assessment of the mine operation's compliance with the approved permit. Permits contain specific protective measures developed through interagency coordination; ensuring compliance with these conditions is critical to protecting the environment.
- Result in earlier detection of adverse impacts to ground and surface water outside the permit area. Earlier detection would allow for earlier correction to conditions that could impact aquatic wildlife and people.
- Limit activities in or near intermittent and perennial streams and reduce the number and length of intermittent and perennial stream segments disturbed by mining. Streams provide habitat, drinking water and recreational space.
- Minimize disturbance and adverse impacts to perennial and intermittent stream segments of high environmental value. Stream segments with high environmental value include those that support sensitive species or unique attributes that deserve greater protection.
- Grant clear authority to the regulatory agency to require that surface coal mining operations promote enhancement of fish, wildlife, and related environmental values wherever and whenever practicable. Enhancement of habitats to offset impacts to habitats disturbed during mining would help to ensure that wildlife have sufficient resources to meet their life cycle needs.
- Improve reforestation on sites disturbed by coal mining. This would improve the ability of the landscape to filter contaminants from runoff before the runoff reaches the stream.
- Increase use of native species on sites disturbed by coal mining. Native plant species require less maintenance because they are better adapted to the environment and require less water and fertilization to thrive long-term. They resist damage from freezing, drought, common diseases, and herbivores. They also may fill specific roles in the ecosystem and provide higher forage value to wildlife.
- Increase the extent of forested riparian areas on mine sites. Forested riparian areas enhance streams because they trap sediments before they reach the stream. They connect fragmented habitat and create wildlife movement corridors. They aid stream ecological health by shading the water to help keep cold water streams cold and by providing leaf litter in the streams, which serves as food source for macroinvertebrates and later in the food chain for fish.

Specific to water resources, the Preferred Alternative would provide Major Beneficial impacts in the coal regions of the Appalachian and Illinois Basins. Specifically:

- Major benefits are anticipated in the Appalachian Basin:
- Four fewer stream miles would be filled annually;
- Improved mining practices would lead to improved stream quality in approximately 174 stream miles annually and improved groundwater;
- Percentage of groundwater usage for private consumption is the highest of the regions, suggesting this region would benefit most from improved groundwater protection; and
- Major benefits would occur in the Illinois Basin:
- Downstream water quality would be improved for 33 stream miles annually;
- Ephemeral stream restoration would occur for 7 stream miles annually;
- For Colorado Plateau, Gulf Coast, and Northern Rocky Mountains and Great Plains, regional benefits would be moderate:
- Four to 29 stream miles would be improved annually;
- Two to six ephemeral stream miles would be restored annually;
- Groundwater protection would be improved; two to three percent of households in this region rely on private groundwater supplies.

While this summary of the impacts of the Preferred Alternative is informative, it does not highlight the impacts that would occur over the long-term. Tables ES.12-1 and ES.12-2 provide a quantitative summary of the benefits to streams and forests over the twenty-one year study period for the analysis (2020 through 2040).

Table ES.12-2.
Results of the Preferred Alternative: Annual Stream Impacts (Miles)

Coal Region	Downstream Improved (Miles Per Year)	Downstream Preserved (Miles Per Year)	Not Filled (Miles Per Year)	Restored (Miles Per Year)
Appalachian Basin	174	0	4	1
Colorado Plateau	4	0	0	2
Gulf Coast	29	0	0	6
Illinois Basin	33	0	0	7
Northern Rocky Mountains and Great Plains	16	0	0	5
Northwest	1	0	0	0
Western Interior	5	0	0	1
Total Per Year	**263 miles**	**0 mile**	**4 miles**	**22 miles**
Total Over The 21- Year Study Period (2020 to 2040)	**5,520 miles**	**0 miles**	**88 miles**	**462 miles**

Notes: Downstream water quality improved (miles): Streams that experience water quality improvements with the SPR.
Downstream stream miles preserved: Streams that do not experience water quality impacts due to reduced mining activity.
Stream miles not filled: Streams not filled due to SPR.
Stream miles restored: Mined through streams that are restored due the SPR.
Totals may not sum due to rounding.

ES.12.2.1.2 Cumulative Impacts

The potential for the rule to have cumulative effects with other actions that might affect the same resources in the past, present or reasonably foreseeable future was also analyzed. After determining a resource-specific spatial and temporal boundary, information on other regulatory actions that would interact with the Action Alternatives was gathered, as well as other non-regulatory actions that would affect the same resources.

The diverse set of affected resources, combined with the broad geographic and temporal scope of the SPR, makes cumulative impact analysis highly challenging. A large set of past, present, and reasonably foreseeable future actions could interact with the Alternatives. These include:

- Regulatory actions directly related to mining and surface (e.g., stream) water quality;
- Rules that affect coal-fired power plants that could affect coal demand;
- Overall trends in the coal mining industry and energy markets;
- Other trends that affect resources in the study area and that may alter the cumulative impacts of the proposed actions; and
- Other secondary regulatory actions.

Table ES.12-3.
Results of the Preferred Alternative: Annual Forest Impacts (Acres)

Coal Region	Improved (Acres Per Year)	Preserved (Acres Per Year)
Appalachian Basin	1,313	7
Colorado Plateau	274	0
Gulf Coast	397	0
Illinois Basin	257	1
Northern Rocky Mountains and Great Plains	78	0
Northwest	0	0
Western Interior	166	0
Total Per Year	**2,486 acres**	**8 acres**
Total Over The 21- Year Study Period (2020 to 2040)	**52,211 acres**	**163 acres**

Notes: Improved Acres – Land that will benefit from improved forest land cover under the SPR because it would otherwise have been put in grassland, pastureland or an Alternative post mining land use, or would have been reforested under the baseline but the Alternative prescribes better practices to ensure healthier forest postmining.
Preserved Acres – Forest area that is left uncut due to changes in coal mining activity.
Totals may not sum due to rounding.

The diverse set of affected resources, combined with the broad geographic and temporal scope of the SPR, makes cumulative impact analysis highly challenging. Indeed, simply identifying the full suite of past, present, and future actions affecting water resources in coal mining areas in the U.S. is not feasible. For example, dozens, if not hundreds, of federal, state, and local laws and regulations could be perceived as being relevant to protecting the quality of water resources in streams affected by mining. Furthermore, an array of individual projects (e.g., dam construction, dredging), permitting decisions, and economic trends could further influence water quality. Identifying and accounting for all of these factors is not practical, and prediction of cumulative impacts based on such an approach would be speculative. Because it is practically infeasible to characterize every potentially relevant cumulative action in all coal-producing areas in the U.S., the analysis focuses on identifying the primary actions – particularly those

that may combine with the Alternatives to produce noteworthy cumulative effects. This approach is consistent with CEQ guidance, which states that "a cumulative effects analysis should 'count what counts,' not produce superficial analyses of a long laundry list of issues that have little relevance to the effects of the proposed action on eventual decisions" (CEQ, 1997).

Under the No Action Alternative, a wide variety of past, present, and reasonably foreseeable future actions are anticipated to affect the same natural resources affected by the Action Alternatives. These include other regulatory actions related to coal mining and surface water quality, such as other existing SMCRA provisions, the Clean Water Act, actions that regulate coal combustion and coal-fired power plants, as well as local and regional initiatives. These actions also include non-regulatory trends, such as the ongoing trend in the coal market and coal industry overall, other land uses, such as forestry, agriculture, and development patterns. For most natural resources, the overall cumulative trend across the study area is difficult to discern because there are often actions with negative impacts on a resource (e.g., residential development on biological resources) as well as positive impacts (e.g., watershed restoration activities).

For most natural resources, implementation of one of the Action Alternatives would reduce impacts of coal mining on natural resources that would have occurred under the No Action Alternative (other than for socioeconomics, as discussed below). This is especially true when the Action Alternatives are considered in combination with other actions of similar intent not related to the current action (e.g., river conservation initiatives, etc.). Thus, for resources other than socioeconomics, Action Alternatives (except for Alternative 9) are anticipated to either have beneficial or a countervailing cumulative effect, depending on the underlying trends occurring for a particular resource. For example, the overall cumulative trend in water resources across the study area is difficult to discern when considering other cumulative actions with negative impacts (e.g., agriculture) as well as those with positive effects (e.g., river conservation initiatives). The Action Alternatives (except for Alternative 9) are anticipated to result in direct or indirect benefits to water resources. Thus, when the Action Alternatives are considered in combination with other actions and trends, the Alternatives are expected to result in either a net increase in beneficial impacts or a net reduction in adverse impacts to the resource (countervailing). Alternative 9 is anticipated to have a neutral cumulative effect.

The Action Alternatives are expected to produce Minor to Major Adverse impacts to socioeconomics, depending on the region and Alternative. These adverse impacts are primarily related to long-term adverse impacts to coal mining industry employment and the often small and rural communities that depend upon industry employment as well as other services. These effects would primarily occur in the Appalachian Basin, the Illinois Basin, and the Northern Rocky Mountains and Great Plains regions. The analysis also anticipates some reduction in severance and other tax collections over time related to reduced coal production. While these impacts are forecasted for all the Action Alternatives (except Alternative 9), they are most prevalent under Alternative 2.

The cumulative effects analysis considers direct and indirect socioeconomic impacts of Action Alternatives in combination with various other trends and actions. Other relevant cumulative actions include regulations with a direct effect on coal mining, as well as actions and trends that are likely to affect the demand for coal over time. For instance, established mining safety rules may continue to affect the profitability of mining while rules on greenhouse gas emissions from coal-fired power plants may

encourage a transition away from coal to substitute fuels. These changes are occurring in the context of other energy sector trends such as decreasing natural gas prices resulting from growth in domestic production. On balance, the coal mining industry faces economic and regulatory challenges in the domestic market.

In 2014, coal mining accounted for 0.06 percent of national employment and 0.1 percent of national income (U.S. Census Bureau, 2014; U.S. EIA, 2016a). Additionally, a shift toward the more labor-intensive underground mining in the Appalachian Basin region, combined with an overall depletion of the most readily accessed surface reserves, has led to an offsetting increase in coal mining employment in recent years. For context, EIA estimates that 2014 coal industry employment was approximately 75,000 employees (U.S. EIA, 2016a). This analysis projects that coal industry employment will decrease by over 7,000 FTEs under baseline conditions from 2020 to 2040. This decrease in employment demand that is expected to occur independent of the Proposed Rule is consistent with the declining demand for U.S. coal from retiring coal-fired power plants and is expected to occur primarily in the Appalachian Basin, the Illinois Basin, and the Northern Rocky Mountains and Great Plains regions.

While the socioeconomic implications of the Action Alternatives are minor, they would be added to existing and anticipated adverse conditions in the coal mining industry. Therefore, the cumulative impact of the Action Alternatives (excluding Alternative 9), in combination with other actions and trends, is classified as negative. Alternative 9 is anticipated to have a neutral cumulative effect.

Chapter 1. Purpose of and Need for the Federal Action

1.0 Introduction

1.0.1 Proposed Action

The Office of Surface Mining Reclamation and Enforcement (OSMRE) is considering revising the regulations implementing the Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. §§ 1201-1328). These regulations are found in Parts 700 through 999 of Title 30 of the Code of Federal Regulations (CFR).

The proposed action seeks to revise the regulations to provide a better balance between the Nation's need for coal as an essential energy source with the need to prevent or mitigate adverse environmental effects of present and future surface coal mining operations. The proposed action applies to both surface and underground mines.

This Environmental Impact Statement (EIS) evaluates several Alternatives. Each Action Alternative considered in detail is made up of various regulatory components (hereafter referred to as elements), to achieve some or all of the following objectives:

- Providing for the collection of more comprehensive environmental baseline data for proposed coal mining operations;
- Defining "material damage to the hydrologic balance outside the permit area;"
- Establishing more protective standards for mining activities in or near streams (including mining through streams);
- Providing for more comprehensive monitoring of groundwater and surface water;
- Improving the effectiveness of monitoring by providing for periodic review and analysis of all monitoring results;
- Revising excess spoil disposal and postmining surface configuration requirements to minimize adverse impacts on streams;
- Revising the provisions for approval of variances and exceptions from approximate original contour restoration requirements to more completely implement the statute;
- Revising the definitions of ephemeral, intermittent stream and perennial streams to be more consistent with the corresponding definitions used by the U.S. Army Corps of Engineers (USACE) for purposes of implementing Section 404 of the Clean Water Act;
- Providing for coordination with Clean Water Act permitting activities to the extent practicable;
- Improving soil salvage and redistribution standards to ensure construction of an appropriate root zone on the reclaimed area;
- Providing that revegetation success standards be established in a manner that documents restoration of premining capability;

- Providing for the increased use of native species;
- Promoting reforestation and fish and wildlife protection and enhancement; and
- Updating measures to protect threatened and endangered species and designated critical habitat under the Endangered Species Act of 1973.

OSMRE is also proposing a number of changes that would improve the consistency, accuracy, implementation, and ease of use of existing regulations. These changes do not require evaluation in this FEIS because of their administrative nature. They include:

- More detailed requirements for preparation of the determination of the probable hydrologic consequences of the proposed operation (the PHC determination) and the Cumulative Hydrologic Impact Assessment (CHIA);
- Improved coordination between the SMCRA regulatory authority and the agencies responsible for implementing the Clean Water Act (33 U.S.C. §§ 1251-1387);
- Incorporating into regulation the policy requirement that appropriate and adequate financial assurance be posted to guarantee treatment of long-term discharges, and otherwise updating performance bond and bond release requirements; and
- Reorganizing, restructuring, and rewriting regulations in accordance with Executive Order 12114 on using Plain Language in Government Writing and Section 501(b) of SMCRA.

This EIS has been prepared in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq.*) and the implementing regulations of the Council on Environmental Quality (CEQ) (40 CFR Part 1500-1508), and the Department of the Interior (43 CFR Part 46).

1.0.2 Organization of this Document

This EIS is organized into nine chapters:

Chapter 1 describes the steps taken by OSMRE to comply with NEPA for this proposed federal action. It also describes the process used to identify the affected public and agency concerns and to define the issues and Alternatives that required detailed examination in this EIS (scoping). In addition, Chapter 1 provides a summary of comments received during the scoping process. Finally, Chapter 1 describes the purpose of and need for the proposed federal action.

Chapter 2 describes the nine Alternatives that were examined in detail, including the No Action Alternative (current regulations) and the Preferred Action Alternative. This chapter also describes several additional Alternatives that OSMRE considered but did not carry forward for detailed analysis. This chapter also describes the process used in developing the Alternatives examined in this EIS.

Chapter 3 describes the affected environment—i.e., the general environmental conditions of the seven coal-producing regions in the United States where 95 percent of total U.S. coal production occurs and is anticipated to occur in the future. Those regions are the Appalachian Basin, the Colorado Plateau, the Gulf Coast, the Illinois Basin, the Northern Rocky Mountains and Great Plains, the Northwest, and the Western Interior.

Chapter 4 analyzes the environmental consequences of each of the Alternatives analyzed in detail. This chapter also includes a description of the scope and impact of existing regulations (including regulations other than the implementing regulations for SMCRA) as part of the discussion of the No Action Alternative.

Chapter 5 describes the consultation and coordination that OSMRE has undertaken as part of the EIS development process.

Chapter 6 lists preparers of and contributors to this EIS.

Chapter 7 lists the references cited in this EIS.

Chapter 8 lists acronyms used in this EIS.

Chapter 9 provides a glossary of terms used in this EIS.

The appendices, which provide additional information and support for the discussion in this EIS, are located in a separate volume.

1.0.3 Background - The 1979, 1983, and 2008 Stream Buffer Zone Rules

SMCRA was enacted into law on August 3, 1977. Some of the stated purposes of the Act are:

- To establish a national program to protect society and the environment from the adverse effects of surface coal mining operations;
- To assure that surface mining operations are not conducted where reclamation as required by the Act is not feasible;
- To assure that reclamation occurs as contemporaneously as possible with surface coal mining operations;
- To strike a balance between protection of the environment and agricultural productivity and the need for coal as an essential source of energy;
- To assist the States in developing and implementing regulatory and abandoned mine land reclamation programs to achieve the purposes of the Act;
- To promote reclamation of areas mined before the enactment of SMCRA;
- To provide appropriate procedures for public participation in the development, revision, and enforcement of regulations, standards, reclamation plans, and regulatory programs under SMCRA.

The Act sets forth minimum performance standards for environmental protection and public health and safety which apply to surface coal mining and reclamation operations, including the surface effects of underground coal mining operations. Persons who propose to conduct surface coal mining and reclamation must apply for permits that meet the requirements of the applicable regulatory program. After the regulatory authority approves a permit application, the applicant must post a performance bond to guarantee completion of the approved reclamation plan. Upon receipt of a suitable bond, the regulatory authority will issue the permit.

The Act provides that any state may obtain primary jurisdiction over the regulation of surface coal mining and reclamation operations on non-federal and non-Indian lands within its borders if it submits and

receives approval of a regulatory program under the Act. Indian tribes may also obtain primary jurisdiction over the regulation of surface coal mining and reclamation operations on land under the jurisdiction of the Indian tribe. A state or tribal program becomes effective after review and approval by the Secretary of the Interior. Coal mining is currently occurring in 25 states, and on lands of the Navajo, Crow and Hopi nations. To date, all but two of the states have achieved primacy; i.e. approval to serve as the regulatory authority on non-federal and non-Indian lands. As of the date of this EIS, no tribal nation has achieved primacy. States with primacy are eligible to enter into a cooperative agreement with the Secretary of the Department of the Interior to regulate mining on federal lands within their borders. Most states with mineable coal on federal lands have entered into such cooperative agreements. OSMRE has a limited enforcement role in a state with an approved program. This role includes (1) conducting such inspections as are necessary to evaluate the administration of state programs, (2) conducting inspections where a state, after notification from OSMRE of "any information" of a violation, fails to respond appropriately within ten days, (3) issuance of a cessation order when an OSMRE inspector finds a situation that presents an imminent danger to public health or safety or imminent danger of significant environmental harm, and (4) substitution of federal enforcement of a state program when a state is not effectively implementing, administering, or enforcing its approved program. OSMRE retains direct regulatory authority over coal mining on Indian lands and in states without primacy. Only one of the states without primacy (Tennessee) currently produces coal.

OSMRE's first permanent program performance standards, as published on March 13, 1979, included stream buffer zone (SBZ) rules at 30 CFR 816.57 (for surface mining operations) and 817.57 (for underground mining operations). Except for stream-channel diversions, those rules provided that no surface area within 100 feet of a perennial stream or a stream with a biological community may be disturbed by surface operations or facilities unless the regulatory authority finds that the original stream channel would be restored and that, during and after mining, the activities would not adversely affect the water quantity and quality of the stream segment within 100 feet of those activities.

The 1979 rules also defined "intermittent stream" in two ways. One method relied on hydrological criteria, while the other method classified all streams that drain a watershed of one square mile or larger as intermittent even if those streams do not meet the hydrological criteria for an intermittent stream. A stream meeting either of those criteria qualified as intermittent; the stream did not need to meet both criteria. This definition did not impact the 1979 stream buffer zone rule, but it proved to be relevant to implementation of subsequent stream buffer zone rules.

In 1983, OSMRE revised the stream buffer zone rules to delete the requirement that the original stream channel be restored. The 1983 rule replaced the biological community criterion for determining which non-perennial streams must be protected with a requirement for protection of all intermittent streams. Finally, the rule specified that the regulatory authority may authorize mining activities through or within 100 feet of a perennial or intermittent stream only after finding that the proposed activities would not cause or contribute to a violation of applicable state or federal water quality standards and would not adversely affect the water quality or quantity or other environmental resources of the stream.

On December 12, 2008, OSMRE published a revised SBZ rule that replaced the findings in the 1983 rule with a requirement that permittees avoid conducting mining activities in perennial and intermittent streams unless the regulatory authority finds that avoiding disturbance of the stream is not reasonably

possible. The prohibition did not apply to mining through streams, for which the standard for approval was that the stream-channel diversion be located and designed to minimize adverse impacts on fish, wildlife, and related environmental values to the extent possible, using the best technology currently available. The 2008 rule also prohibited mining activities on the surface of land within 100 feet of perennial and intermittent streams unless (1) they are part of mining activities (such as the construction of excess spoil fills, coal mine waste disposal facilities, sedimentation pond embankments, or bridge abutments) that the regulatory authority has approved to take place in the pertinent stream segment itself, (2) the regulatory authority finds that avoidance is not reasonably possible, or (3) the regulatory authority finds that the prohibition is not needed to meet fish and wildlife and hydrologic balance protection requirements.

The 2008 rule required that permittees (1) design and conduct their operations to minimize the volume of excess spoil generated by mining operations and (2) design and construct fills to be no larger than needed to accommodate the anticipated volume of excess spoil to be generated. As part of the excess spoil minimization requirement, the rule required that mining operations return the excavated overburden to the mined-out area to the extent possible, after taking into consideration applicable regulations concerning restoration of approximate original contour, safety, stability, and environmental protection, as well as the needs of the postmining land use.

The 2008 rule also provided that, to minimize adverse impacts on fish, wildlife, and related environmental values, the operation must be designed to avoid constructing excess spoil fills, refuse piles, or slurry impoundments in perennial and intermittent streams to the extent possible. When avoidance was not possible, the rule required that the permit application identify a range of reasonable alternatives for disposal and placement of the excess spoil or coal mine waste, evaluate their environmental impacts, and select the Alternative with the least overall adverse impact on fish, wildlife, and related environmental values. The rule established criteria for determining whether a potential Alternative is reasonably possible; as part of those criteria, it stated that an Alternative generally may be considered unreasonable if its cost is substantially greater than the costs normally associated with this type of project.

Shortly after publication of the 2008 rule, ten environmental organizations challenged the validity of the rule. *See Coal River Mountain Watch v. Salazar*, No. 08-2212 (D.D.C., filed Dec. 22, 2008) and *National Parks Conservation Ass'n v. Salazar*, No. 09-115 (D.D.C., filed Jan. 16, 2009). Because of the litigation, OSMRE never requested that states with primacy amend their programs. Thus, the 2008 SBZ rule took effect only in states with federal regulatory programs (of which only Tennessee has active coal mining) and on Indian lands.

On November 30, 2009, OSMRE published an Advance Notice of Proposed Rulemaking (ANPR) seeking public comment on how current regulations should be revised to reduce "the harmful environmental consequences of surface coal mining operations in Appalachia, while ensuring that future mining remains consistent with federal law" (OSMRE, 2009). The ANPR confirmed that "[t]he Secretary of the Interior remains committed to reducing the adverse impacts of Appalachian surface coal mining operations on streams." The ANPR also indicated that OSMRE would consider whether "revisions to other OSMRE regulations, including approximate original contour (AOC) requirements, are needed to better protect the environment and the public from the impacts of Appalachian surface coal mining." Further, the ANPR solicited comments "identifying significant issues, studies, and specific alternatives that we should

consider in the [Supplementary Environmental Impact Statement (EIS)] for this rulemaking initiative" (74 FR 62664-62668, Nov. 30, 2009). OSMRE received approximately 32,750 comments during the 30-day comment period on various issues related to stream protection.

On February 20, 2014, the U.S. District Court for the District of Columbia issued an order that vacated the 2008 SBZ rule, which had the effect of reinstating the pre-2008 version of the vacated rules. *See Nat'l Parks Conservation Ass'n v. Jewell*, 2014 U.S. Dist. LEXIS 152383, at *31-*34 (D.D.C. Feb. 20, 2014). On December 22, 2014, OSMRE formally removed the provisions of the vacated 2008 rule from the Code of Federal Regulations and reinstated the prior regulations (79 FR 76227-76233).

1.0.3.1 Previous Environmental Impact Statements Related to Stream Protection

After the passage of SMCRA on August 3, 1977, the Secretary of the Interior, through OSMRE, developed regulations for both the initial and permanent regulatory programs required by SMCRA (30 U.S.C. 1211(c)(2)). OSMRE prepared a programmatic environmental impact statement (OSMRE EIS-1) that analyzed the environmental consequences of Alternatives for the permanent program regulations. OSMRE published OSMRE EIS-1 as final in January 1979. The permanent program regulations were published as a Final Rule on March 13, 1979 (44 FR 15313, Mar. 13, 1979).

In 1981, OSMRE identified a need for changes to the March 1979 regulations. OSMRE analyzed the effects of the Proposed Rule changes on the environment in EIS-1 Supplement, released in January 1983.

Beginning in 2003, OSMRE initiated a rulemaking to revise regulatory requirements for placement of excess spoil generated during mining, and to revise the stream buffer zone rule. OSMRE prepared an EIS to support this rulemaking and announced the availability of the Final EIS in the *Federal Register* on October 24, 2008 (73 FR 63510, Oct. 24, 2008).

CEQ's regulations implementing NEPA encourage agencies to incorporate information by referring to information already presented in other documents to reduce unnecessary repetition (40 CFR 1502.21). Therefore, when applicable and appropriate, OSMRE relies on and references analyses in the following EIS documents:

- U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement. Excess Spoil Minimization--Stream Buffer Zones, Proposed Revisions to the Permanent Program Regulations Implementing the Surface Mining Control and Reclamation Act of 1977 Concerning the Creation and Disposal of Excess Spoil and Coal Mine Waste and Stream Buffer Zones. Final Environmental Impact Statement OSMRE-EIS-34, Sept. 2008.[17]

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[17] The validity of this EIS was challenged in *Coal River Mountain Watch et al. v. Jewell*, No. 08-2212 (D.D.C., filed Dec. 22, 2008). However, after the court vacated the rule that was the subject of this EIS in *Nat'l Parks Conservation Ass'n v. Jewell*, 2014 U.S. Dist. LEXIS 152383, at *34 (D.D.C. Feb. 20, 2014), the court held that the NEPA challenge was moot. *See Coal River Mountain Watch et al. v. Jewell*, No. 08-2212, Memorandum Decision at 2 (D.D.C., Feb. 20, 2014). The DEIS and FEIS for this rulemaking use information from this document to discuss aspects of the purpose and need (see sections 1.0.4 and 1.1.3), the history of the environmental analyses for the 2008 rule (see section 3.0.3), and aspects of the affected environment such as soils, topography and biological resources (see sections 3.3, 3.4 and 3.8) and trends of mining under existing regulations (see section 4.2.2 and section 4.2.3).

- U.S. Environmental Protection Agency, Mountaintop Mining/Valley Fills in Appalachia, Draft Programmatic Environmental Impact Statement (MTM-VF DPEIS), EPA 9-03-R-00013, EPA Region 3, June 2003 and Final Programmatic Environmental Impact Statement (MTM-VF FPEIS), October 2005.[18]

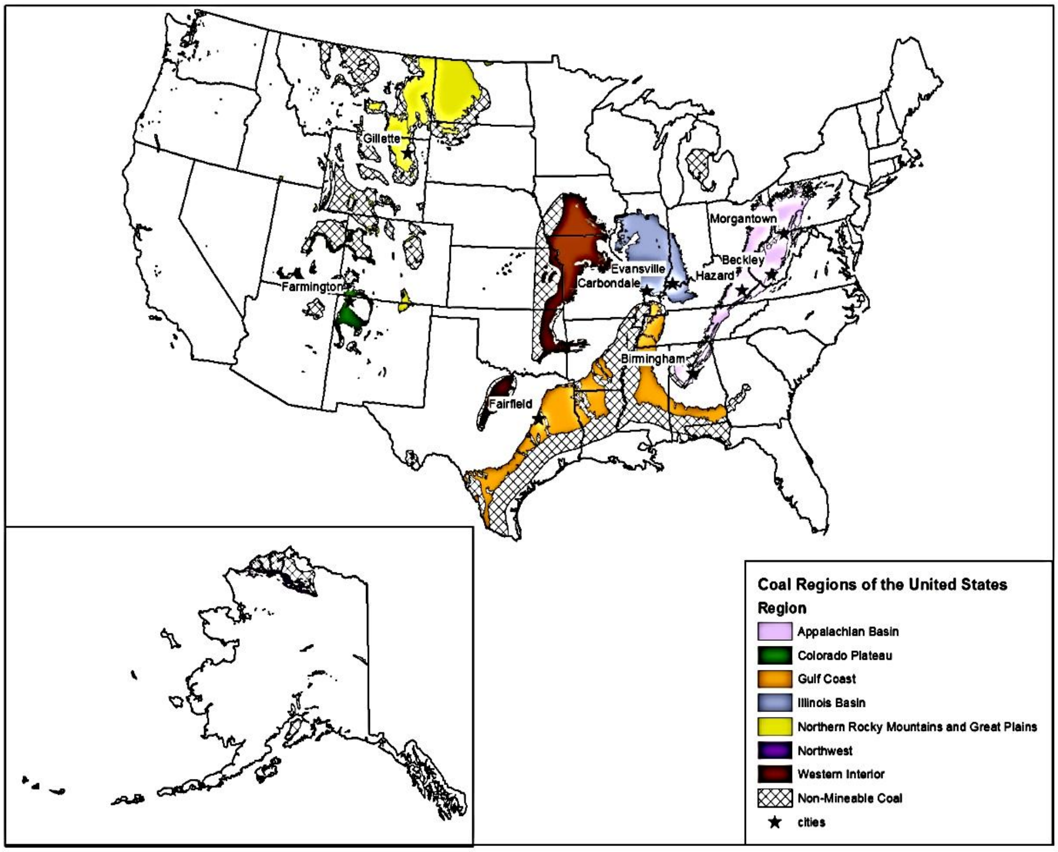
1.0.3.2 Public Participation in Development of this DEIS

OSMRE published the first Notice of Intent (NOI) to prepare an EIS under Section 102(2)(C) of the NEPA in the *Federal Register* on April 30, 2010 (75 FR 22723). OSMRE also posted that notice on the bureau's website. OSMRE invited comments and suggestions on the scope of the analysis, including the eleven principal elements of the contemplated action. OSMRE received 25 written comments during this initial scoping period.

On June 18, 2010, OSMRE published a second NOI to announce that nine open house format scoping meetings would be held to collect information on the proposed Alternatives and elements under consideration in the rulemaking, and to extend the comment period (75 FR 34666). The second NOI invited comments on possible Alternatives based on eleven principal rule elements. During the additional 45-day public scoping period, OSMRE held open houses in Carbondale, IL; Evansville, IN; Birmingham, AL; Fairfield, TX; Hazard, KY; Beckley, WV; Morgantown, WV; Farmington, NM; and Gillette, WY. These nine cities are located in or near the major coal-producing regions of the U.S. and are accessible to the majority of the population living in those regions (Figure 1.0-1). Approximately 400 people attended the open houses and provided almost 450 written and oral comments. In addition, 20,126 comments were received via electronic and hard copy submissions outside of the open houses.

[18] Information from this document is used within the discussion of topography in section 3.4, for the discussion of wetlands in section 3.9, for the discussion of stream fills in section 4.2.1.4, and within the discussion of downstream effects within the documented impacts of mining under the no action alternative in section 4.2.2.1.

Figure 1.0-1. Map of Coal Regions and Scoping Open-House Locations Used in EIS Development



Source: Coal fields layer obtained from *USGS National Atlas*. To prepare this figure OSMRE modified the coal fields data to distinguish mineable versus non-mineable coal by region.

1.0.3.3 Issues Identified Through Public Involvement

1.0.3.3.1 Comments from EIS Scoping

Some of the comments received during scoping were related to Alternatives that OSMRE might consider in both the Proposed Rulemaking and within the analysis of the DEIS. Most commenters provided specific comments regarding each of the principal elements and possible Alternatives set out in the June 18, 2010 NOI. Of these comments, some recommended clarifications to existing rules as opposed to a new rulemaking, made suggestions pertaining to specific elements or Alternatives within the Proposed Rulemaking, or raised new issues or rule elements for consideration.

Comments generally fell into two categories: (1) comments in support of rule revisions that would provide greater environmental protection for streams and other natural resources; and (2) comments that support the adequacy of the existing regulations.

Some commenters favoring greater environmental protections advocated interpretation of the 1983 SBZ rule as an absolute prohibition on stream impacts. This group of comments often described the 1983 SBZ rule as a bright-line prohibition against any adverse impacts within the stream buffer zone. Other

comments suggested that OSMRE should assess the effects of an Alternative that would ban surface mining of coal entirely.

OSMRE incorporated most of the comments described above regarding Alternatives into the development of the Alternatives analyzed. The suggestion to include an Alternative that would ban surface coal mining entirely was not incorporated because that Alternative is not authorized under SMCRA and would not meet the purpose and need for the proposed action.

1.0.3.3.2 Comments in Response to the Advance Notice of Proposed Rulemaking

Additional substantive comments were received on the ANPR. Some of these comments highlighted the impacts of surface coal mining and current regulatory shortcomings regarding streams:

- Large surface mines in the interior coal basins of the U.S. typically impact numerous streams during the mining process. There is a need for consistent, scientifically viable methods of evaluating the premining condition of these streams, as well as the impacts of mining on them.
- Plans for stream protection and restoration should provide for consistent application of best practices nationwide to assure restoration of form and function as well as maintenance of streams' ecological value. Measurements of success should be uniformly applied.
- When possible, stream restoration plans should provide for enhancements as part of the reclamation process.
- After reclamation, changes in the water table near re-established stream channels may result in loss of intermittent or perennial streams or conversion to ephemeral streams.

Other commenters opposed changes to current rules and asserted that additional regulation would impair mining operations, increase costs, endanger jobs at a time of high unemployment, and provide little, if any, additional protection for the environment. Some comments questioned the authority of OSMRE under SMCRA to adopt certain measures under consideration. Others asserted that OSMRE had failed to articulate a need for new regulations so soon after adopting the 2008 SBZ Rule.

Although some commenters emphasized the need for nationwide stream protection regulations, other commenters, especially those from the coal-producing regions of the Midwest and the West, questioned the need to promulgate a nationwide Stream Protection Rule, arguing that there is no evidence of adverse impacts on streams outside Appalachia. These commenters also argued that because of regional differences, many elements under consideration would be inapplicable, cumbersome, costly, or impractical to apply outside Appalachia.

Comments received in response to the ANPR and impacts of operating under the existing regulations were incorporated into the analysis of the DEIS where appropriate. In addition, they were also incorporated into the Proposed Rule language as appropriate.

1.0.3.3.3 Comments on the DEIS and the Proposed Rule

On July 16, 2015, OSMRE announced that the Proposed Rule, Draft Environmental Impact Statement (DEIS), and Draft Regulatory Impact Analysis (RIA) were available for review at www.regulations.gov, on our web site (www.osmre.gov), and at selected OSMRE offices. On July 17, 2015, OSMRE published a notice in the Federal Register announcing the availability of the DEIS for the Proposed Rule. See 80

FR 42535-42536. The notice reiterated that the DEIS was available for review at www.regulations.gov, www.osmre.gov, and the OSMRE offices listed in the notice. The comment period for the DEIS was originally scheduled to close on September 15, 2015. On July 27, 2015, OSMRE published the Proposed Stream Protection Rule in the Federal Register. See 80 FR 44436-44698. That document reiterated that the Proposed Rule, DEIS, and Draft RIA were available for review at www.regulations.gov, www.osmre.gov, and the OSMRE offices listed in the notice. The comment period for the Proposed Rule and Draft RIA was originally scheduled to close on September 25, 2015. In response to requests for additional time to review and prepare comments on all three documents, OSMRE extended the comment period for the Proposed Rule, DEIS, and Draft RIA through October 26, 2015. See 80 FR 54590-54591 (Sept. 10, 2015).

During the public comment period, OSMRE held six public hearings on the Proposed Rule and DEIS in Golden, Colorado (September 1, 2015); Lexington, Kentucky (September 3, 2015); St. Charles, Missouri (September 10, 2015); Pittsburgh, Pennsylvania (September 10, 2015); Big Stone Gap, Virginia (September 15, 2015); and Charleston, West Virginia (September 17, 2015). In addition to the testimony offered at the hearings and meetings, OSMRE received approximately 94,000 written or electronic comments on the Proposed Rule. Responses to comments on the DEIS are included in Appendix K of this FEIS. Responses to comments on the Proposed Rule are provided in the preamble to the Final Rule.

1.0.4 Scope of Analysis

This EIS evaluates a range of Alternatives related to stream protection and the conservation of fish, wildlife and related environmental values, including a No Action Alternative, under which the current federal regulations would be unchanged. OSMRE carefully considered all issues raised during the scoping and public outreach process associated with this action when developing the Alternatives.

OSMRE analyzed the effects of each Alternative on the seven most productive coal-bearing regions of the United States (Figure 1.0-1 above). Some coal regions have a more extensive mining history than others, leading to variable data availability across the seven regions. In addition, environmental impacts are disparate across the regions, largely due to historical trends in coal production. Data tend to be more readily available in regions with an extensive mining history and legacy coal mining impacts. In some instances, when data are limited, OSMRE relies on reasonable assumptions to evaluate the relative impacts of different Alternatives (see Chapter 4).

In analyzing the Alternatives, OSMRE relied on reports included in previous EISs and considered studies published since preparation of the 2008 EIS (see Chapter 7 for a complete list of references). OSMRE also obtained updated factual information relevant to stream protection from OSMRE field offices and state regulatory agencies. In addition, OSMRE conducted one new study for this EIS in cooperation with the U.S. Environmental Protection Agency (U.S. EPA) (Pond et al. 2014). The study examined biological community composition downstream from reclaimed valley fills. This was a follow-up to a 2008 study (Pond et al. 2008). More details are provided in Chapter 4 Section 4.2.2.

1.1 Need for the Federal Action

The need for this federal action is to improve implementation of SMCRA to ensure protection of the hydrologic balance, and reduce impacts of surface coal mining operations on streams, fish, wildlife, and related environmental values. In considering this need, OSMRE has identified several subcomponents of our regulations that could be improved.

- First, there is a need to define "material damage to the hydrologic balance outside the permit area" and ensure that each permit identifies the point at which adverse mining impacts on groundwater and surface water (both of which provide stream flow) reach an unacceptable level; that is, the point at which they would cause material damage to the hydrologic balance outside the permit area.
- Second, there is a need to collect adequate premining data about the site of the proposed mining operation and adjacent areas to establish a comprehensive baseline against which the impacts of mining can be compared.
- Third, there is a need for effective, comprehensive monitoring of groundwater and surface water both during and after mining and reclamation to provide timely documentation of the impacts of mining and to enable prompt detection of any adverse trends and implementation of corrective measures before it is either too late to take remedial measures or exceedingly costly to do so.
- Fourth, there is a need to ensure protection or restoration of perennial and intermittent streams and related resources including fish and wildlife, especially headwater streams that are critical to maintaining the ecological health and productivity of downstream waters.
- Fifth, there is a need to ensure the use of objective standards in making important regulatory and operational decisions with a potential impact on perennial and intermittent streams.
- Sixth, there is a need to ensure that permittees and regulatory authorities make use of advances in information, technology, science, and methods related to surface and groundwater hydrology, surface-runoff management, stream restoration, soils, and revegetation, all of which relate directly or indirectly to protection of water resources and the ability of mined land to support the uses that it was capable of supporting before mining.

After evaluating the comments received on the ANPR, OSMRE identified a need for a comprehensive rulemaking to better protect streams nationwide. Refinement of existing regulations is needed to more completely implement SMCRA's permitting requirements and performance standards and provide regulatory clarity to operators and stakeholders while better achieving the purposes of SMCRA as set forth in section 102 of the Act. In particular, to more completely realize the purposes in paragraphs (a), (c), (d), and (f) of that section, which include establishing a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations and assuring that surface coal mining operations are conducted in an environmentally protective manner and are not conducted where reclamation is not feasible. Furthermore, the this action is needed to addresses court decisions and strike the appropriate balance between environmental protection, agricultural productivity and the Nation's need for coal as an essential source of energy, while providing greater regulatory certainty to the mining industry.

1.1.1 Need for Regulatory Improvements

Section 201(c)(2) of SMCRA requires that the Secretary of the Interior, acting through OSMRE, "publish and promulgate such rules and regulations as may be necessary to carry out the purposes and provisions of this Act." In section 101(c) of SMCRA, Congress found that:

> many surface coal mining operations result in disturbances of surface areas that burden and adversely affect commerce and the public welfare by … polluting the water, by destroying fish and wildlife habitats, by impairing natural beauty, … and by counteracting governmental programs and efforts to conserve soil, water, and other natural resources.

The federal action analyzed in this EIS will better prevent or remediate the adverse impacts that Congress described when it made this finding. Despite the enactment of SMCRA and the promulgation of federal regulations implementing the statute, surface coal mining operations continue to have negative effects on streams, fish, and wildlife. These conditions are documented in the literature surveys and studies discussed in Chapter 4. Further evidence is available through several decades of observing the impacts of coal mining operations. These documented and observed problems have prompted OSMRE to consider whether it should take a different approach in the regulations implementing the following SMCRA provisions related to stream protection:

- Section 510(b)(3) of SMCRA in effect requires that each surface coal mining operation be designed to prevent material damage to the hydrologic balance outside the permit area. Current regulations intentionally do not define the extent of damage that is allowable and how much damage constitutes "material damage," an approach that was intended to afford regulatory authorities flexibility in making determinations on a case-by-case basis (48 FR 43973, Sept. 26, 1983).
- Section 515(b)(2) of SMCRA requires that mined land be restored to a condition capable of supporting the uses that it was capable of supporting prior to mining. Alternatively, it allows mined land to be restored to a condition capable of supporting higher or better uses of which there is reasonable likelihood, provided certain conditions are met. Existing rules and permitting practices have focused primarily on the land's suitability for a single approved postmining land use, which may or may not be implemented. OSMRE believes it is essential to ensure that land be restored to a condition in which it is capable of supporting all uses that it was capable of supporting before mining, unless the approved postmining land use is implemented before final bond release.
- Section 515(b)(10) of SMCRA requires that mining operations minimize disturbances to the prevailing hydrologic balance at the mine site and in associated offsite areas. It also requires that mining operations minimize disturbances to the quality of water in surface water and groundwater systems both during and after surface coal mining operations and during reclamation. As discussed in more detail in Chapter 2, OSMRE is evaluating a number of options to provide the most effective implementation of this statutory requirement, including regulatory options for avoidance of acid and toxic drainage from mine sites. OSMRE also seeks the most effective regulation of excess spoil fill construction because of the potential effects of those fills on the hydrologic balance, water quality, and aquatic life.
- Sections 515(b)(19) and 516(b)(6) of SMCRA require the operator to establish a diverse, effective, permanent vegetative cover of the same seasonal variety native to the area on all

regraded areas and other lands affected by mining. However, many previously forested areas have been reclaimed with heavily compacted soils that reduce site productivity and the ability of the site to support productive forests. These sites are commonly revegetated as grasslands with scrub trees, and vegetation that is not representative of native premining vegetation. OSMRE is considering Alternatives that would implement these SMCRA provisions more effectively.

- Sections 515(b)(24) and 516(b)(11) of SMCRA require, subject to certain limitations, that surface coal mining and reclamation operations minimize disturbances and adverse impacts on fish, wildlife, and related environmental values. These provisions also require operations to "achieve enhancement of such resources where practicable." Reconstructed streams, however, often neither look nor function the way they did before mining. The emphasis has been primarily upon creating a channel sufficient to convey postmining flows, while minimizing channel erosion and sediment loading. Until recent years, there has been relatively little attention paid to the impact of mining on water quality and hence aquatic life in reconstructed streams and in streams downstream of the mining operation. Particularly in Appalachia, streams may no longer support the benthic and other aquatic communities that they did before mining. Additionally, efforts to enhance fish, wildlife, and related environmental values have not been evenly implemented as part of state reclamation programs, despite the presence of that requirement in both the statute and the regulations.
- OSMRE's current rules at 30 CFR 816.73 allow excess spoil fills to be constructed by end-dumping. With end-dumping, operators push or dump rock overburden over the side of the mountain to cascade into the valley below, with the larger rocks rolling to the bottom of the valley to form the underdrain. Based on several decades' experience implementing the existing rules, OSMRE is reexamining the extent to which this technique accords with a number of SMCRA requirements. For instance, some end-dumping may not comply with Section 515(b)(22)(A) of SMCRA which provides that all excess spoil material resulting from surface coal mining operations must be "transported and placed in a controlled manner in position for concurrent compaction and in such a way to assure mass stability and to prevent mass movement." End-dumping, moreover, can result in elevated dissolved ion concentrations in water leaving the site and significant increases in concentrations of total dissolved solids (TDS) in receiving streams, both of which may adversely affect fish and wildlife in contravention of Section 515(b)(24) of SMCRA. Further, construction of end-dumped rock fills can result in inconsistent development of the underdrains required under Section 515(b)(2) of SMCRA, leading to structural instability of the fill.
- Section 515(b)(3) requires, with certain exceptions, that mined land be restored to AOC. Restoration of mined land to a surface configuration that includes convex and concave terrain patterns and landforms typical of the premining surface configuration could more effectively meet this requirement. The existing rules governing AOC restoration are general, subjective, and lacking in specificity. Too often, this has resulted in postmining surface configurations that are significantly flatter than the premining configuration; that lack many of the landform features found prior to mining; and that have significantly altered drainage patterns and stream characteristics and functions. OSMRE has identified a number of instances where the regulatory authority overlooked inadequate contour restoration until late in the process (at which point correcting the problem would be overly expensive or cause unacceptable disruption of stabilized

conditions). OSMRE is evaluating Alternatives to address this problem including additional mapping and reporting regarding compliance with contour restoration.

1.1.2 Need for Adequate Data

To effectively evaluate the impacts of a mining operation and to ensure implementation of SMCRA's requirements, the regulatory authority must have both sufficient baseline data and sufficient data about ongoing changes to stream-related resources and biota. Adequate data about the conditions before the mining activity are critical to ascertaining the extent and cause of any changes that do occur after mining is underway; this information in turn is critical to correcting problems if and when they occur. To ensure that the necessary corrections can be made to prevent and mitigate damage, the regulations must specify the types of information that need to be collected, and the locations, timing, and frequency of information collection. As discussed above, Section 510(b)(3) of SMCRA requires that each surface coal mining operation be designed to prevent material damage to the hydrologic balance outside the permit area. Section 515(b)(10) of SMCRA requires, in essence, that surface coal mining and reclamation operations "minimize the disturbances to the prevailing hydrologic balance at the mine site and in associated offsite areas and to the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations and during reclamation." For underground mining, Section 516(b)(9) of SMCRA requires operations to minimize disturbances to the prevailing hydrologic balance at the mine site and associated offsite areas, and to ensure the quantity of water. Sections 515(b)(24) and 516(b)(11) of SMCRA require, subject to certain limitations, that surface coal mining and reclamation operations minimize disturbances and adverse impacts on fish, wildlife, and related environmental values; and also require operations to "achieve enhancement of such resources where practicable."

As discussed previously, studies indicate that environmental degradation is still occurring despite the current requirements within the implementing regulations of SMCRA. OSMRE has determined that this research indicates that effective evaluation of trends and impacts on groundwater, surface water, and stream-related resources and biota would require additional monitoring of data beyond what is currently required by existing regulations. Additional water quality parameters must be monitored both in the baseline condition and within any effluent leaving mine sites. Similarly, existing regulations do not provide for collection of baseline data sufficient to determine the biological condition of streams. Consequently, characteristics of the aquatic community in the stream are not well documented in SMCRA permit files. This impedes regulators' ability to assess whether an operation is adequately minimizing adverse impacts on fish, wildlife, and related environmental values, as required by Sections 515(b)(24) and 516(b)(11) of SMCRA. More complete and accurate baseline information is needed to improve regulators' ability to determine whether mine plans are designed in accordance with SMCRA, and whether operations are being conducted in accordance with mining plans. For example, better baseline data would facilitate a more thorough CHIA, would help set objective and measurable material damage standards, and would help identify and address hydrologic problems that may arise after permit issuance.

Additional monitoring data are also needed to provide sufficient warning when water impacts are approaching thresholds where evaluations should occur to prevent further damage. This change would help operators and regulators evaluate the potential for the operation to result in material damage to the hydrologic balance.

1.1.3 Need for Adequate Objective Standards

To effectively implement SMCRA's requirements related to stream protection, regulations must allow permittees and operators, as well as regulatory authorities, to effectively evaluate compliance and limit or prevent adverse impacts, as appropriate.

The regulatory standards must provide an objective threshold with clear and predictable standards for preventing "material damage to the hydrologic balance outside the permit area," as required by Section 510(b)(3) of SMCRA. That section requires that each surface coal mining operation be designed to prevent material damage to the hydrologic balance outside the permit area. However, neither OSMRE nor most states have defined this term. A clear federal definition and federal minimum standards or criteria against which to measure whether material damage has occurred is needed to provide a basis for oversight of state implementation of this statutory requirement.

As noted above, based on observed changes, OSMRE believes that existing permitting and performance standards implementing Section 515(b)(10) of SMCRA may be inadequate to minimize disturbances to the prevailing hydrologic balance at the mine site and to the quality of water in surface and ground water systems. More specific, more clearly defined and objective standards would improve implementation of this statutory requirement.

1.1.4 Need to Apply Current Information, Technology, and Methods

This federal action is also designed to incorporate significant advances in scientific knowledge that have occurred since OSMRE's permanent program regulations were adopted in 1979 and then substantially amended, starting in 1983.

First, new information exists on the adverse impacts that coal mining can cause to water resources and stream biota. As discussed in more detail in Chapter 4, there are many recent publications of studies and literature surveys that evaluate the impacts of surface coal mining and reclamation operations on water quantity and quality, as well as related biological resources.

Second, since OSMRE's earlier rulemakings, there have been significant improvements in technologies and methods for prediction, prevention, mitigation, and reclamation of coal mining impacts on hydrology, streams, fish, wildlife, and related resources. As discussed in more detail in Chapter 4, OSMRE has identified major improvements in technology and methods related to identifying, quantifying, mapping, and modeling mining operations and their impacts on the environment. Examples of such improvements are discussed below.

Advances in identification and prediction of impacts on stream resources. Since the 2008 SBZ rule, there have been significant improvements in analysis of the impacts of mining on stream resources. For instance, coal mining-related regulatory programs have traditionally focused on acid mine drainage and sediment loads as the sources of potential problems. However, as described in Chapter 4 of this EIS, the fracturing of overburden as part of the mining process results in significant increases in conductivity and TDS in streams below many surface mines, particularly below excess spoil fills. Those changes can have significant toxic effects on streams, leading to a loss of sensitive aquatic organisms even when downstream habitats are otherwise intact. Emerging science indicates that problems can include golden alga blooms and adverse impacts to fish and wildlife from the discharge or formation of chemical

constituents not considered in past rulemaking efforts. Further, data now indicate that some pollutants, such as selenium, may bio-accumulate. Accumulation of pollutants in biological systems over time may adversely affect biota and human health. In addition, new studies indicate that toxic discharges may continue for decades even after reclamation of the site has otherwise been successful according to current requirements for restoration of the land itself.

Landform elements such as ridges, valleys, hill slopes, and streams can now be measured quantitatively in a way not feasible until recently. Permit reviewers can now use computers and sophisticated software to process huge amounts of elevation data acquired from stereo satellite and airborne images, lidar, and radar to produce much more accurate maps and models of surface configuration than was possible a few short years ago. This information may allow state regulators to determine the total volume of earth that a mining operation has displaced or will displace, based on the position of the coal seams and volume of overburden relative to the premining topography. These data can also be used to plan for restoration of smaller-scale features that blend into the surrounding topography within a watershed. By contrast, reclamation practices under existing regulations often rely on construction of uniformly sized and spaced structures and features.

Advances in reclamation techniques. Emerging science now provides much better information on effective reclamation practices related to stream protection. During the last decade, the scientific community has made great strides in developing geomorphic reclamation strategies that reduce erosion and improve water quality. These improvements are not reflected in current regulations. More traditional approaches to restoration of AOC have created large reclaimed acreages that resemble landscapes of agricultural fields, urban recreational parks, or construction fill sites such as large dam embankments, spillways, or waterway diversions. Modern Global Positioning System (GPS)-enabled equipment can incorporate the use of geomorphic principles in reclamation design, and can provide a closer approximation of the highly dissected and randomly spaced and sized drainage patterns of an undisturbed landscape. The Los Angeles abrasion test (a standard test method for determining resistance to degradation) and the sodium or magnesium sulfate soundness test (which distinguishes between rocks based on their susceptibility to weathering) can be used to assess the appropriateness of material used in fills. Hydrologic modeling programs such as the USACE Hydrologic Engineering Center, Hydrologic Modeling System (HEC-HMS) can predict with greater accuracy the flow pattern and volume of runoff that would occur under different rainfall scenarios at defined locations. Use of programs such as the Civil Software Design, LLC Sediment, Erosion, Discharge by Computer Aided Design (SEDCAD) program can more effectively design and evaluate erosion and sediment control systems. Such improvements in reclamation may significantly improve restoration of ephemeral streams, protection of water quality in perennial and intermittent streams, and long-term landscape stability.

Advances in reforestation techniques have been shown to decrease the detrimental effects of storm runoff. Science now indicates that high nutrient loads can have negative, cumulative impacts downstream, but that streamside buffer zones can reduce those nutrient loads and associated impacts. OSMRE experience over the past thirty years indicates that extensive herbaceous ground cover on reclaimed areas can inhibit the establishment and growth of trees and shrubs. The dense herbaceous ground covers historically used to control erosion compete with newly planted trees and tree seedlings for soil nutrients, water, and sunlight, and provide habitat for rodents and other animals that damage tree seedlings and young trees.

1.2 Purpose of the Federal Action

Our primary purpose in considering this rulemaking is to strike a better balance between "protection of the environment and agricultural productivity and the Nation's needs for coal as an essential source of energy." Specifically, our purpose is to minimize the adverse impacts of surface coal mining operations on surface water, groundwater, and site productivity, with particular emphasis on protecting or restoring streams, aquatic ecosystems, streamside habitats and vegetative corridors, native vegetation, and the ability of mined land to support the uses that it was capable of supporting before mining. The proposed action reflects our experience during the more than three decades since adoption of the existing regulations, as well as advances in scientific knowledge and mining and reclamation techniques during that time. In addition, as proposed, OSMRE revised and reorganized the regulations for clarity, to make them more user-friendly, to remove obsolete and redundant provisions, and to implement plain language principles.

Chapter 2. Description of All Alternatives Including the No Action Alternative

2.0 Introduction

This chapter of the Final Environmental Impact Statement (EIS) introduces and describes the eight Action Alternatives that the Office of Surface Mining Reclamation and Enforcement (OSMRE) is considering in its Proposed Stream Protection Rule (SPR). It also discusses the No Action Alternative, which reflects current applicable regulations, policies and practices.

In addition, this chapter identifies and describes the eleven principal elements for evaluation (factors for analysis) within each of the nine Alternatives that OSMRE is considering. For ease of discussion and analysis, OSMRE has organized these eleven principal elements into the following four “functional groups” under each of the Alternatives. These functional groups recognize common or related characteristics that address an overarching rulemaking topic or concern:

- Protection of the Hydrologic Balance;
- Activities in or near Streams;
- Approximate Original Contour (AOC) and AOC Variances; and
- Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement.

Table 2.1-1 summarizes the principal elements using these four functional groups. Grouping certain elements together helps to illustrate their relationship and makes the impact analysis clearer and easier to follow. For example, when discussed together, it is easier to draw the connection between *establishing* a baseline for surface water and groundwater characteristics, *monitoring ongoing changes* from the baseline condition during mining and reclamation and *establishing evaluation thresholds*[19] to prevent environmental damage. Further, the functional grouping demonstrates how these elements relate to protection of the hydrologic balance.

2.1 Development of the Alternatives

OSMRE identified the need for improved stream protection through internal analysis and external scoping and public outreach activities. Public concerns ranged from support for an outright ban on certain coal mining practices to maintaining the current regulations (the No Action Alternative) and providing time to implement the regulatory changes adopted in the 2008 Stream Buffer Zone (SBZ) rule. Some participants focused on environmental issues, while others expressed concerns about the potential costs and impacts

[19] Evaluation thresholds were referred to as “corrective action thresholds” in the DEIS and Proposed Rule. Evaluation thresholds are numeric values lower than the material damage thresholds for the corresponding parameters

from any Proposed Rulemaking on the coal mining industry, employment, affected regulatory authorities, and local, regional, and national economies.

Table 2.1-1.
Organization of 11 Principal Elements (Factors for Analysis) into Functional Groups

Functional Groups	Protection of the Hydrologic Balance	Activities in or near Streams	AOC and AOC Variances	Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement
Factors for Analysis (Principal Elements)	Baseline data collection and analysis	Stream definitions	Surface configuration	Revegetation, topsoil management, and reforestation
Factors for Analysis (Principal Elements)	Monitoring during mining and reclamation	Activities in or near streams, including disposal of excess spoil and coal mine waste	AOC variances	Fish and wildlife protection and enhancement
Factors for Analysis (Principal Elements)	Definition of material damage to the hydrologic balance outside the permit area	Mining through streams	---	---
Factors for Analysis (Principal Elements)	Evaluation thresholds	---	---	---

OSMRE published the first Notice of Intent (NOI) to conduct scoping for this DEIS in the *Federal Register* on April 30, 2010 (75 FR 22723, Apr. 30, 2010). OSMRE invited comments and suggestions on the scope of the analysis, including the principal elements of the contemplated action. OSMRE received 25 written comments during this initial scoping period. On June 18, 2010, OSMRE published a second NOI announcing nine additional scoping “open houses” to provide information on the proposed Alternatives and elements under consideration in the rulemaking and to accept public comments (75 FR 34666, Jun. 18, 2010). The second NOI invited comments on possible Alternatives, based on 11 principal elements.

As part of the scoping process, OSMRE held open houses in Carbondale, IL; Evansville, IN; Birmingham, AL; Fairfield, TX; Hazard, KY; Beckley, WV; Morgantown, WV; Farmington, NM; and Gillette, WY. OSMRE selected these locations based on proximity to the major coal-producing regions of the U.S. and accessibility to the majority of the population living in those regions (Figure 1.0-1). Approximately 400 people attended the open houses and provided 450 written and oral comments. In addition, OSMRE received over 20,000 comments via electronic and hard copy submissions outside the open houses.

In developing a reasonable range of Alternatives, OSMRE also considered responses to an Advance Notice of Proposed Rulemaking (ANPR) published on November 30, 2009, which sought public comment on how OSMRE should revise current regulations to reduce “the harmful environmental consequences of surface coal mining operations in Appalachia, while ensuring that future mining remains consistent with Federal law” (74 FR 62664-62668, November 30, 2009). The ANPR also indicated that OSMRE would consider whether “revisions to other OSMRE regulations, including AOC requirements,

are needed to better protect the environment and the public from the impacts of Appalachian surface coal mining." OSMRE received approximately 32,750 comments during the 30-day comment period on various issues, including those related to stream protection.

As a result of interagency discussions, internal reviews, and consideration of the comments received in response to the ANPR and during the extensive DEIS scoping process, OSMRE revised the principal rulemaking elements. In the process, OSMRE also identified the need for application of consistent, scientifically viable methods for evaluating the biological condition of streams, and for restoring their form and ecological function after mining. Section 1.0.1 provides a complete list of rulemaking elements that OSMRE considered.

OSMRE continued to refine the Alternatives based on preliminary input from the state and federal cooperating agencies, and later based on federal interagency review of the Preferred Alternative facilitated through the Office of Information and Regulatory Affairs (OIRA). OIRA is part of the Office of Management and Budget (OMB), which is an agency within the Executive Office of the President. The OMB is tasked per Executive Order 12866, "Regulatory Planning and Review," with the review of federal agency draft and proposed final regulatory actions.

2.2 Overview of the Alternatives and Chapter Organization

This chapter (Chapter 2) describes Alternatives that OSMRE considered with respect to the eleven principal elements outlined in the two NOIs, with modifications based on comments received and analysis of the Alternatives. Section 2.3 provides a brief description of the eleven elements. Section 2.4 describes the nine Alternatives in detail, organized by Alternative. Section 2.5 reverses that approach by grouping the Alternatives under the principal elements to assist the reader in identifying the Alternatives that address a particular concern. Finally, Section 2.6 describes Alternatives and elements that OSMRE considered, but subsequently dismissed without further analysis. OSMRE dismissed these Alternatives for several reasons, including that they: (1) were not reasonable; (2) did not meet the purpose and need of the proposed federal action as described in Chapter 1 of this FEIS; and/or (3) were outside the scope of the Proposed Rulemaking.

2.3 Range of Analysis for Each of the Eleven Principal Elements

In the NOIs, OSMRE published a list of eleven principal issues (elements) to be analyzed for the Stream Protection Rulemaking initiative. Initially, these eleven elements included baseline data requirements; a definition of material damage to the hydrologic balance outside the permit area; restrictions on activities in, near, or through streams; monitoring requirements; evaluation thresholds; surface configuration; variances to approximate original contour restoration requirements; enhanced reforestation activities; permit coordination among agencies; financial assurances for long-term treatment of postmining discharges; and stream definitions.

OSMRE revised the list of principal elements after further analysis and in light of the comments received during scoping. For example, OSMRE analyzes "mining through streams" and "activities that occur in or near streams" as separate principal elements because OSMRE believes these two categories of mining activities are significantly different. Mining *through* streams typically means that operators would excavate coal deposits beneath the streambed. In this situation, the operator would either permanently divert the stream channel or reconstruct it in its original location after mining. Mining *in or near* streams

refers to activities that take place within a stream or its buffer zone. These activities may sometimes cover the stream but never include removal of the streambed to extract coal. Examples of activities that may occur in or near streams include construction of sedimentation ponds, water treatment facilities, excess spoil fills or coal mine waste disposal facilities, and stream crossings.

OSMRE also added fish and wildlife protection and enhancement as a principal element and expanded the enhanced reforestation element to include revegetation, reforestation, and soil management.

2.4 Description of Alternatives

This section describes each of the nine Alternatives according to the four functional groups discussed above. As noted earlier, each functional group combines elements that have similar or interrelated attributes.

2.4.1 Alternative 1 (No Action Alternative)

Alternative 1, the No Action Alternative, consists of current regulatory requirements, policies, and practices under the Surface Mining Control and Reclamation Act (SMCRA), the Clean Water Act (CWA), and other federal and state laws that are relevant to this federal action. For reasons of brevity, this discussion describes only the requirements for surface coal mining operations. However, in most instances, analogous requirements apply to underground mining operations. If OSMRE were to select this Alternative, existing rules under SMCRA would not change.

2.4.1.1 Protection of the Hydrologic Balance

2.4.1.1.1 Baseline Data Collection and Analysis

Under the current regulations, the applicant for a mining permit is required to submit, at a minimum, the following baseline information, and any additional hydrologic or geologic information required by the regulatory authority.[20]

Groundwater: Under 30 CFR 780.21, the applicant must submit data for existing wells, springs, and other groundwater resources within or adjacent to the proposed permit area. These data characterize the quality and quantity of groundwater and provide information on usage sufficient to demonstrate seasonal variation. Information on water quality must include total dissolved solids or specific conductance, pH, total iron, and total manganese. Groundwater quantity information must include approximate rates of discharge or usage, as well as depth to the water in the coal seam, each water-bearing stratum above the coal seam, and each potentially affected stratum below the coal seam.

Surface water: Under 30 CFR 780.21, the applicant must submit information on surface water quality and quantity sufficient to demonstrate seasonal variation and water usage. At a minimum, water-quality information must include baseline information on total suspended solids, total dissolved solids or specific

[20] Unless otherwise specifically stated, the term "regulatory authority" as used in this FEIS refers to the SMCRA regulatory authority.

conductance, pH, total iron, and total manganese. The applicant must provide additional information on baseline acidity and alkalinity if there is a potential for acidic drainage from the proposed mining operation. Water quantity information must contain information on seasonal flow rates.

Geology: Under 30 CFR 780.22, the permit application must describe the geology of the proposed permit area and the adjacent area down to and including the deeper of either (1) the stratum immediately below the lowest coal seam to be mined or (2) any aquifer below that seam that could be adversely affected by mining. The description must include the areal and structural geology of the proposed permit area and the adjacent area. The description must also address other parameters that influence the required reclamation and the occurrence, availability, movement, quantity, and quality of potentially impacted surface water and groundwater. The geologic information must also include analyses of samples collected from test borings, drill cores, or samples from rock outcrops from the permit area. This requirement includes lithologic characterization and chemical analysis of strata and the coal seam for acid-forming or toxic-forming materials (including total sulfur, pyritic sulfur, and alkalinity-producing materials). The regulatory authority may waive analysis for alkalinity-producing materials and pyritic sulfur if sufficient data exists to document that the data is not needed.

2.4.1.1.2 Monitoring During Mining and Reclamation

The current regulations at 30 CFR 780.21(i) and (j) and 816.41(c) and (e) require monitoring of the quantity and quality of surface water and groundwater. The monitoring plan must include parameters related to the suitability of the water for current and approved postmining land uses, the hydrologic reclamation plan, and (for surface water) the effluent limitations in 40 CFR Part 434. At a minimum, pH, total iron, total manganese, total dissolved solids (TDS) or specific conductance, water levels (for groundwater), flow (for surface water), and total suspended solids (TSS) (for surface water) must be monitored every three months until final bond release. The permittee must monitor point-source discharges in accordance with their National Pollutant Discharge Elimination System (NPDES) permit. The monitoring plan must identify the monitoring locations, but the regulations do not establish criteria for the number or placement of monitoring locations.

The regulatory authority may modify or waive the monitoring requirements at any time if the permittee demonstrates that monitoring, in whole or in part, is no longer necessary to achieve the purposes set forth in the monitoring plan; that the operation has minimized disturbance to the hydrologic balance within the permit area and prevented material damage to the hydrologic balance outside the permit area; that water quality and quantity are suitable to support the approved postmining land uses; and that the water rights of other users have been protected or adequately replaced. However, all effluent limitations and conditions must comply with NPDES permit issued for your operation by the appropriate authority under the Clean Water Act, 33 U.S.C. 1251 et seq. In addition, the regulatory authority may not modify or waive NPDES monitoring requirements.

2.4.1.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

The current regulations do not define material damage to the hydrologic balance outside the permit area. However, the preamble to existing 30 CFR 780.21(g) and 784.14(f) states that “because the gauges for measuring material damage may vary from area to area and from operation to operation,” OSMRE has not established fixed criteria, except for those established under §§ 816.42 and 817.42 related to

compliance with water quality standards and effluent limitations (48 FR 43973, Sept. 26, 1983). OSMRE further noted in the preamble to the existing rules that each regulatory authority should establish criteria to measure material damage to the hydrologic balance for purposes of cumulative hydrologic impact assessments (48 FR 43973, Sept. 26, 1983).

2.4.1.1.4 Evaluation Thresholds

The current regulations contain no requirement for specific evaluation thresholds. However, permit applicants proposing to conduct surface or underground coal mining are required under § 780.21(h) or § 784.14(g) respectively, to provide a plan of measures the applicant would take to avoid adverse potential adverse hydrologic consequences, including preventative and remedial measures. Under 30 CFR 816.41(c)(2) and (e)(2) and 817.41(c)(2) and (e)(2), if monitoring results demonstrate noncompliance with permit conditions or federal, state, or tribal water quality laws and regulations, the permittee must promptly notify the regulatory authority. The applicant must then take all possible steps to minimize any adverse impact to the environment or public health and safety, and must immediately implement measures necessary to comply with permit condition (30 CFR 773.17(e)).

2.4.1.2 Activities in or Near Streams

2.4.1.2.1 Stream Definitions

The current regulatory definitions of perennial, intermittent, and ephemeral streams utilize hydrologic characteristics and watershed size to define these waters (30 CFR 701.5). The current definitions do not include biological or chemical characteristics.

- Under the current regulations, a perennial stream is a stream or part of a stream that flows continuously during all of the calendar year because of groundwater discharge or surface runoff.
- An intermittent stream is (1) a stream or reach of a stream that drains a watershed of at least one square mile, <u>or</u> (2) a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains flow from both surface runoff and groundwater discharge.
- An ephemeral stream is a stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice, and which has a channel bottom that is always above the local water table.

The definition in the second bullet has sometimes been incorrectly interpreted as if the “or” was an “and;” i.e., the one-square-mile criterion has sometimes been applied as a threshold for all intermittent streams, when, in fact, a stream in a smaller watershed that meets the second criterion is an intermittent stream regardless of the size of its watershed.

2.4.1.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

The 1983 SBZ rule, 30 CFR 816.57, which is now back in effect after the court vacated the 2008 rule,[21] provides that mining activities may not disturb land within 100 feet of a perennial or an intermittent

[21] See 79 FR 76227-76233 (Dec. 22, 2014).

stream unless the regulatory authority specifically authorizes activities closer to, or through, such a stream. The regulatory authority may authorize such activities only after finding that the proposed activities would not cause or contribute to a violation of applicable federal or state water quality standards under the Clean Water Act and would not adversely affect the water quantity and quality or other environmental resources of the stream.

The 1983 SBZ rule does not specifically mention placement of excess spoil and coal mine waste in or within 100 feet of streams, but OSMRE and most state regulatory authorities generally have applied the 1983 SBZ rule in a manner that allows the construction of excess spoil fills, refuse piles, slurry impoundments, and sedimentation ponds in all types of streams and their buffer zones.

The existing regulations at 30 CFR 816.71 through 816.74 require that excess spoil fills be constructed by controlled placement of the excess spoil in lifts no greater than four feet thick, except that durable rock fills may be constructed by end-dumping, which is intended to result in the formation of underdrains by gravity segregation.

In general, only surface coal mining operations in steep-slope terrain generate excess spoil. Although not expressly required by regulation, most states with mining operations in steep-slope terrain have adopted policies intended to minimize the generation of excess spoil and thus reduce the need for (and size of) excess spoil fills, which in turn would reduce the length of stream covered by those fills. In addition, the agencies administering the Clean Water Act have implemented policies that have sharply reduced both the number of excess spoil fills and the length of stream covered by those fills. Furthermore, the regulations in 40 CFR Part 230 for implementation of section 404(b)(1) of the Clean Water Act require an analysis of all practicable alternatives to placement of fill material in waters of the United States, which would include most streams. Under those regulations, the applicant must select the alternative with the least adverse effect on the aquatic ecosystem and mitigate any remaining adverse impacts on the aquatic environment.

2.4.1.2.3 Mining Through Streams

The 1983 version of the stream-channel diversion rules at 30 CFR 816.43 is now back in effect following the court decision vacating the 2008 SBZ rule. Under 30 CFR 816.43(b)(1), the regulatory authority may approve diversion of perennial or intermittent streams within the permit area only after making the finding related to stream buffer zones in 30 CFR 816.57 that the diversion would not adversely affect the water quantity and quality and related environmental resources of the stream. Under 30 CFR 816.43(a), the applicant must design the diversion to minimize adverse impacts to the hydrologic balance within the permit and adjacent areas, prevent material damage to the hydrologic balance outside the permit area, and to assure the safety of the public. In addition, the applicant must design, locate, construct, maintain, and use the diversion to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow outside the permit area.

Under 30 CFR 816.43(b)(4), both the design and construction of stream-channel diversions for perennial and intermittent streams must be certified by a qualified registered professional engineer as meeting applicable performance standards and any design criteria established by the regulatory authority. Under 30 CFR 816.43(a)(3), the design for restored stream channels for perennial and intermittent streams (or permanent diversion channels for those streams) must restore or approximate the premining

characteristics of the original stream channel, including the natural riparian vegetation. Under 30 CFR 816.43(b)(2), the design capacity for both temporary and permanent stream-channel diversions must at least equal the capacity of the unmodified stream channel immediately upstream and downstream of the diversion.

2.4.1.3 AOC and AOC Variances

2.4.1.3.1 Surface Configuration

Under existing 30 CFR 780.18(b)(3), each permit application must include a plan for backfilling, soil stabilization, and compacting and grading. Contour maps or cross-sections must show the anticipated final surface configuration. The performance standards at 30 CFR 816.102, 816.104, 816.105, 816.106, and 816.107 require that disturbed areas be backfilled and regraded to closely resemble the premining surface configuration, with exceptions for thin and thick overburden situations, previously mined areas, and certain other circumstances. The regulations allow permanent impoundments, including final-cut impoundments, provided they do not otherwise create conflicts with achieving AOC and they meet the design, construction, maintenance, postmining land use, and other requirements in 30 CFR 800.40(c)(2), 816.49(b), and 816.133.

2.4.1.3.2 AOC Variances

The current regulations provide for the approval of permits for mountaintop removal mining operations, which are exempt from AOC restoration requirements if the postmining land use and postmining surface topography requirements of paragraphs (3) and (4) of section 515(c) of SMCRA are met. The regulations also provide for the approval of AOC variances for steep-slope mining operations under certain conditions.

As described in 30 CFR 785.14(b), mountaintop removal mining operations are surface mining activities in which the mining operation removes an entire coal seam or seams running through the upper fraction of a mountain, ridge or hill by removing substantially all of the overburden off the bench and creating a level plateau or gently rolling contour, with no highwalls remaining. To obtain a permit for mountaintop removal mining operations, the proposed postmining land use must be a commercial, industrial, residential, agricultural, or public facility land use. The regulatory authority must find that the proposed postmining land use meets all requirements for alternative postmining land uses and is an equal or better economic or public use of the land compared to its premining use. The permit application must include specific plans for the proposed postmining land use, including assurance of investment in public facilities and documentation of private financial capability to ensure completion. The current regulations do not require implementation of the approved postmining land use prior to final bond release.

Under 30 CFR 824.11(a)(9), the regulatory authority may approve a permit for a mountaintop removal mining operation only upon a demonstration that there would be no damage to natural watercourses below the lowest coal seam to be mined. The regulations do not define the term “no damage.” Natural watercourses above the lowest coal seam mined are not protected from damage.

Under 30 CFR 824.11(a)(6), the permittee must leave an outcrop barrier in place at the toe of the lowest coal seam mined to ensure stability.

As defined in 30 CFR 701.5, steep slopes are any slope of more than 20° or a lesser slope designated by the regulatory authority after consideration of soil, climate, and other characteristics of a region or State. To obtain an AOC variance for steep-slope mining operations under 30 CFR 785.16, the proposed postmining land use must be of an industrial, commercial, residential, or public (including recreational facilities) nature. It also must meet the requirements in 30 CFR 816.133 for approval of alternative postmining land uses, which, among other things, means that the postmining use must be an equal or better economic or public use. The applicant must demonstrate that the proposed operation will improve the watershed when compared to either premining conditions or the conditions that would exist if the applicant restored the area to AOC after mining. The regulatory authority can concur that the operation would improve the watershed only if the operation would reduce the amount of total suspended solids or other pollutants discharged from the permit area to surface water or groundwater *or* reduce the flood hazards within the watershed by a reduction of the peak-flow discharge from precipitation events or thaws. In both cases, the total volume of flow from the proposed permit area during every season of the year must not vary in a way that adversely affects the ecology of any surface water or any existing or planned use of surface water or groundwater.

2.4.1.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.1.4.1 Revegetation, Reforestation and Topsoil Management

Under 30 CFR 816.133(a), the permittee must restore all disturbed areas to a condition in which they are capable of supporting the uses that they were capable of supporting before any mining or higher or better uses.

Under 30 CFR 816.22, the permittee must salvage and redistribute all topsoil (the A and E soil horizons), unless alternative overburden materials are approved as being equal to or better than the existing available topsoil to support vegetation. The permittee also must demonstrate that the selected overburden materials they propose to use as topsoil substitutes and supplements are the best available material within the permit area. Paragraph (e) of 30 CFR 816.22 provides that the regulatory authority may require salvage and redistribution of the subsoil (the B and C soil horizons) or other underlying strata if it finds that those layers are necessary to comply with the revegetation performance standards in 30 CFR 816.111 through 816.116.

Paragraph (d) of 30 CFR 816.22 requires that the permittee redistribute topsoil and topsoil substitutes and supplements in a manner that achieves an approximately uniform, stable thickness when consistent with the approved postmining land use, contours, and surface water drainage systems. Soil thickness may vary to the extent necessary to meet the specific revegetation goals identified in the permit. The permittee also must redistribute soil materials in a manner that prevents excess compaction and protects the materials from wind and water erosion before and after seeding and planting.

Under 30 CFR 816.116, revegetation success standards must be based upon the effectiveness of the vegetation to support the approved postmining land use, the extent of ground cover compared to the cover provided by the natural vegetation of the area, and the general requirements of 30 CFR 816.111. These general requirements provide that the vegetative cover must be diverse, effective, and permanent; comprised of species native to the area (with certain exceptions); at least equal in extent of cover to the

natural vegetation of the area; capable of stabilizing the soil surface from erosion; compatible with the postmining land use; have the same seasonal characteristics of growth as the original vegetation; be capable of self-regeneration and plant succession; be compatible with the plant and animal species of the area; and meet the requirements of state and federal laws and regulations concerning seeds, poisonous and noxious plants, and introduced species. The regulations provide limited exceptions to some of these requirements for agricultural crops and for plantings used to establish temporary cover.

2.4.1.4.2 Fish and Wildlife Protection and Enhancement

Under 30 CFR 780.16(a), each permit application must include fish and wildlife resource information for the proposed permit area and the adjacent area. The regulatory authority must determine the scope and level of detail of that information in consultation with state and federal agencies with responsibility for fish and wildlife. Paragraph (b) of 30 CFR 780.16 requires that the permit application also include a fish and wildlife protection and enhancement plan. Paragraph (c) of 30 CFR 780.16 requires that the regulatory authority provide the fish and wildlife resource information and the fish and wildlife protection and enhancement plan to the U.S. Fish and Wildlife Service (U.S. FWS) upon request.

Under the current regulations at 30 CFR 816.97(a), the mine operator must, to the extent possible using the best technology currently available (BTCA), minimize disturbances and adverse impacts to fish, wildlife, and related environmental values and enhance such resources where practicable.

Under 30 CFR 816.97(b), surface mining activities must not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973 (16 U.S.C. §§1531 to 1599). On September 24, 1996, the U.S. FWS issued a biological opinion (BO) and conference report to OSMRE (1996 BO) on the continuation and approval and conduct of surface coal mining and reclamation operations under state and federal regulatory programs adopted pursuant SMCRA where such operations may adversely affect species listed as threatened or endangered or designated critical habitat under the ESA. The 1996 BO explains how this requirement is designed to be implemented; it also provides an incidental take statement. The BO states that the regulatory authority must "implement and require compliance with any species-specific protective measures developed by the USFWS field office and the regulatory authority (with the involvement, as appropriate, of the permittee and OSM[RE])." The BO further provides that, "[w]henever the regulatory authority decides not to implement one or more of the species-specific measures recommended by the USFWS, it must provide a written explanation to the USFWS. If the USFWS field office concurs with the regulatory authority's action, it would provide a concurrence letter as soon as possible. However, if the USFWS does not concur, the issue must be elevated through the chain of command of the regulatory authority, the USFWS, and (to the extent appropriate) OSM[RE] for resolution." OSMRE and the U.S. FWS are coordinating on a MOU, the "ESA MOU" as it was referred to in the Executive Summary, to provide guidance to OSMRE, the U.S. FWS, and the regulatory authorities for demonstrating compliance with the terms and conditions of the Incidental Take Statement accompanying the 1996 biological opinion, which provides incidental take coverage for any take resulting from a proposed coal mining and reclamation operation. The ESA MOU, while still in development as of publication of this document, is part of the current regulatory environment because it adds no new requirements but instead merely provides guidance on existing ones.

Under 30 CFR 816.97(f), the permittee must avoid disturbances to wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes; permittees must enhance where practicable, restore, or replace these resources. Likewise, surface mining activities must also avoid disturbances to habitats of unusually high value for fish and wildlife; these resources must be restored or enhanced where practicable.

Where fish and wildlife habitat is to be a postmining land use, 30 CFR 816.97(g) requires that the plant species to be used on reclaimed areas be selected based upon their proven nutritional value for fish or wildlife, their use as cover for fish or wildlife, and their ability to support and enhance fish or wildlife habitat after bond release. Paragraph (g) also requires that the plants selected be grouped and distributed in a manner that optimizes edge effect, cover, and other benefits to fish and wildlife.

The remaining paragraphs of 30 CFR 816.97 identify assorted other measures that permittees must implement during and after mining to minimize damage to fish and wildlife resources and their habitats or to ensure that all postmining land uses provide some fish and wildlife habitat or travel corridors to the extent practicable.

2.4.2 Alternative 2

Alternative 2 would result in the most significant changes to permit requirements and mining operations under SMCRA. Under Alternative 2, and all the Action Alternatives to follow, the proposed regulatory changes pertain to SMCRA only; implementation of any of the proposed Alternatives below would not affect compliance with any other federal, state or tribal laws.

Alternative 2 would change water monitoring and reporting requirements before and during mining operations and during reclamation. The regulatory authority would be required to coordinate with Clean Water Act implementing agencies to harmonize baseline data collection and monitoring requirements to the extent consistent with each agency’s statutory authority and responsibilities. This Alternative would prohibit mining operations in or through perennial streams; it also would prohibit the placement of excess spoil in intermittent or perennial streams. In addition, it would prohibit all variances from AOC, which could require amendment of SMCRA. Proposed modifications under Alternative 2 are characterized below.

2.4.2.1 Protection of the Hydrologic Balance

2.4.2.1.1 Baseline Data Collection and Analysis

Alternative 2 differs from the No Action Alternative by establishing minimum sample collection intervals and by expanding the suite of parameters for which permittees must analyze all water samples. It also requires documentation of the biological condition of perennial and intermittent streams and the sediment load of the watershed, as well as precipitation.

Under this Alternative, the applicant must collect and submit the following baseline data during the application process:

- Surface water: The applicant must sample all potentially affected perennial and intermittent streams and a representative number of ephemeral streams within the proposed permit and adjacent areas a minimum of 12 times, with the samples evenly spaced over a 12-month period.

The applicant must collect samples for a suite of parameters to include temperature, bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, hot acidity, alkalinity, pH, selenium, specific conductance (or total dissolved solids (TDS)), total iron, total manganese, total suspended solids, arsenic, zinc, copper, cadmium, ammonia, nitrogen, and any additional parameters for which effluent limitations have been established under the NPDES in accordance with section 402 of the Clean Water Act. The applicant must collect continuous streamflow data and must collect stream sediment load data for each watershed.

- Groundwater: The applicant must measure groundwater levels continuously throughout baseline monitoring. The applicant must sample groundwater in perched and regional aquifers at the same frequency and for the same water-quality parameters as surface water (with the exception of total suspended solids). In addition, the baseline monitoring must include static water levels and other quantitative measurements of the aquifer capacity, discharge, and seasonal variation.
- Biological condition of streams: Requires use of comprehensive, multi-assemblage, scientifically defensible bioassessment protocols to document the biological condition of all perennial and intermittent streams and a representative number of ephemeral streams within the proposed permit and adjacent areas over multiple seasons (at a minimum spring, summer, and fall). Requires identification of aquatic biota to the genus taxonomic level.
- Precipitation: Requires use of continuous recording devices to record all precipitation and storm events, including precipitation amounts and the duration of each storm event, not just monthly totals.
- Form and function of streams: Requires documentation of the hydrologic form and ecological function of all perennial and intermittent streams in the proposed permit and adjacent areas.
- Geology: Requires collection of geologic data for the proposed permit and adjacent areas, with a focus on geological characteristics and properties that influence the hydrologic regime or could alter the availability or quality of groundwater and surface water.

2.4.2.1.2 Monitoring During Mining and Reclamation

Under Alternative 2, monitoring of surface water and groundwater during mining and reclamation must occur at least quarterly. The permittee must analyze each sample for the same parameters measured during baseline sampling. The permittee must monitor groundwater and surface water at locations designated in the permit.

The permittee must monitor the biological condition of streams annually until the data demonstrate full restoration of the premining biological condition of the stream.

The permittee must review all monitoring data annually to identify adverse trends and sample analyses that approach evaluation thresholds.

The permittee must collect on-site precipitation measurements using self-recording rain gages. The regulatory authority would review the monitoring data midway through the permit term and during permit renewal cycles. The surface water runoff control plan for designing and monitoring the control structures requires an inspection following a one-year or greater recurrence-interval storm event. The permittee must then submit to the regulatory authority within 48 hours a report prepared by a certified professional

engineer. The report must describe the performance of the hydraulic control structures, assess and describe any potential material damage to the hydrologic balance, and address any remedial measures taken.

Monitoring must continue until final bond release. The regulatory authority may not release the bond until monitoring results document that there are no adverse trends that could result in material damage to the hydrologic balance outside the permit area.

2.4.2.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Section 510(b)(3) of SMCRA provides that the regulatory authority may not approve a permit for surface coal mining operations unless it first finds that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. However, neither SMCRA nor the current regulations implementing SMCRA define the term “material damage to the hydrologic balance outside the permit area.”

Alternative 2 would define material damage to the hydrologic balance outside the permit area as any adverse impact from surface or underground mining operations on the quantity or quality of surface water or groundwater, or on the biological condition of a perennial or intermittent stream, that would preclude attainment or continuance of any designated surface water use under sections 101(a) and 303(c) of the Clean Water Act or any existing or reasonably foreseeable use of surface water or groundwater outside the permit area.

This definition would also apply to adverse impacts from subsidence and to other adverse impacts resulting from underground mining operations (e.g., permanent dewatering of a stream by mining through a fracture zone) that result in material damage to the hydrologic balance. Thus, the definition would not be limited to the impacts from surface mining activities or the impacts of activities conducted on the surface of land (i.e., where surface facilities are located) in connection with an underground coal mine.

2.4.2.1.4 Evaluation Thresholds

Under Alternative 2, the regulatory authority must establish permit-specific or regional evaluation thresholds for key water-quality parameters based on baseline data and the cumulative hydrologic impact assessment (CHIA). These thresholds would define the point at which environmental degradation would become so significant that the permittee must take evaluation to prevent the operation from causing material damage to the hydrologic balance outside the permit area.

The permittee must conduct a water-quality trend analysis of the monitoring data on a quarterly basis. If the analysis of the monitoring data indicates that trends in values for any surface water or groundwater parameter or analyte have reached the evaluation threshold specified in the permit, the permittee must notify the regulatory authority and evaluate the conditions that caused the threshold parameter to be met or exceeded. If the permittee finds, and the regulatory authority agrees, that the increase was due to the permittee’s mining activity, the permittee must develop and implement corrective measures to prevent environmental degradation (i.e., material damage to the hydrologic balance outside the permit area as defined under Alternative 2). Evaluation plans are subject to regulatory authority approval.

The requirement to take evaluation would not apply if the permittee demonstrates, and the regulatory authority concurs in writing, that the adverse values or trends for the parameters of concern are not the result of the permittee's mining operation.

2.4.2.2 Activities in or Near Streams

2.4.2.2.1 Stream Definitions

Instead of using the definitions of streams in the current SMCRA regulations, Alternative 2 would use "waters of the United States" as defined and interpreted under 40 CFR section 230.3(s) and CWA section 404(b)(1). This Alternative would protect all waters defined as "waters of the United States". The definition of an intermittent stream would no longer include the one-square-mile watershed criterion.

2.4.2.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

Alternative 2 would prohibit all mining activities in or within 100 feet of perennial streams. It would also prohibit the construction of excess spoil fills in or within 100 feet of intermittent streams. However, it would allow the construction of excess spoil fills in or within 100 feet of ephemeral streams, and the construction of coal mine waste disposal facilities in or within 100 feet of intermittent or ephemeral streams, provided the operation meets certain conditions. Furthermore, this Alternative would allow the regulatory authority to approve operations that propose to mine through intermittent or ephemeral streams, provided the operation meets certain conditions.

Under this Alternative, an applicant for a permit that proposes to conduct any other type of mining activities in or within 100 feet of an intermittent or ephemeral stream must demonstrate that the proposed activity will not cause material damage to the hydrologic balance outside the permit area. That is, the applicant must demonstrate that the proposed activity would not preclude attainment or maintenance of an existing or reasonably foreseeable designated use of the affected stream segment under section 101(a) or section 303(c) of the Clean Water Act after reclamation and that it will not result in conversion of an intermittent stream segment to an ephemeral stream segment. The applicant must demonstrate that the operation would not have more than a minimal adverse effect on the biological condition of the affected stream segment after reclamation.

Alternative 2 requires that applicants design proposed mining operations to minimize the amount of excess spoil generated. It also requires that the permittee design excess spoil fills and coal mine waste disposal facilities to minimize their footprints. Both requirements are intended to reduce the length of stream that the operation will cover.

Each applicant proposing to place excess spoil in or near an ephemeral stream or to place coal mine waste in or near an intermittent or ephemeral stream must identify and analyze a range of reasonable operational alternatives. The applicant must select the alternative that would have the least adverse impact of all reasonable operational alternatives on fish, wildlife, and related environmental values.

Alternative 2 would require development and implementation of fish and wildlife enhancement measures in compliance with any Clean Water Act mitigation plan as a condition of the SMCRA permit.

Under Alternative 2, the permittee must construct any excess spoil fills in lifts not to exceed four feet in thickness. The current regulation at 30 CFR 816.73 allowing construction of durable rock fills that rely upon end-dumping and the construction of underdrains by gravity segregation of the end-dumped material would be eliminated. This Alternative requires daily monitoring during excess spoil placement. It would revise the existing rules to require that the quarterly inspection reports filed with the regulatory authority include the daily monitoring logs.

Under Alternative 2, the regulatory authority would no longer allow construction of excess spoil fills and coal waste disposal facilities with flat decks on top. The final surface configuration must resemble the surrounding terrain.

Alternative 2 provides that, to the extent that stability considerations allow, the permittee must construct excess spoil fills with aquitards as a barrier to groundwater infiltration, and in a manner that facilitates stream construction. Placement of a layer of lower-permeability spoil or other material near the surface but below the root zone for trees and shrubs could provide the subsurface flow needed to restore flow in intermittent and ephemeral stream segments.

2.4.2.2.3 Mining Through Streams

Alternative 2 prohibits all mining activities in or within 100 feet of perennial streams. Mining through an intermittent stream would be allowed if the hydrologic form and ecological function of the stream can and will be restored. The regulatory authority would consider a stream to be restored in function when its postmining biological condition is comparable to its premining biological condition and in accordance with specific standards established by the Clean Water Act permitting authority. The regulatory authority could permit mining through an ephemeral stream only if the applicant could and would restore the hydrological form of the stream.

To obtain a permit to mine through or divert an intermittent stream, the applicant must demonstrate that the operational design would minimize the length of stream disturbed. The applicant also must demonstrate that the hydrologic form and ecological function of the stream segment can and would be fully restored. With respect to ephemeral streams, the applicant would only need to restore the hydrologic form of the stream segment. The bond posted for the permit must specifically include the cost of restoration of both the form and function of intermittent streams and the hydrologic form of ephemeral streams. Alternative 2 requires the use of natural-channel design techniques when constructing restored stream channels or permanent stream-channel diversions. The reclamation plan must provide for the establishment or preservation of a permanent streamside vegetative corridor,[22] comprised of native non-

[22] In responding to comments on the Proposed Rule, OSMRE has changed the term "riparian corridor" to "streamside vegetative corridor" to alleviate the concern that water-loving plants were required in the 100-foot corridor to either side of the stream even in conditions where water loving plants would not otherwise naturally occur. For the sake of clarity OSMRE has changed this term where used in the other alternatives as well as the preferred.

invasive species (or other native species for non-forested areas), at least 100 feet in width along both banks of the entire reach of restored or permanently diverted ephemeral or intermittent stream channels.

Alternative 2 would require the design and construction of all permanent stream-channel diversions, all temporary stream-channel diversions in use for two or more years, and all restored stream channels to adhere to natural-channel design techniques. Permanent stream-channel diversions and restored intermittent stream channels must approximate the premining characteristics of the original stream channel, including the natural riparian vegetation and the natural hydrological characteristics of the original stream. Finally, Alternative 2 would require that the hydraulic capacity of all temporary and permanent stream-channel diversions be at least equal to the hydraulic capacity of the unmodified stream channel immediately upstream of the diversion and no greater than the hydraulic capacity of the unmodified stream channel immediately downstream of the diversion.

2.4.2.3 AOC and AOC Variances

2.4.2.3.1 Surface Configuration

Alternative 2 would require the use of landforming principles, when consistent with stability and postmining land use considerations, to establish a postmining surface configuration within specific tolerances from the premining surface configuration. Landforming is a design and grading technique that attempts to replicate the appearance of the natural terrain and provide a cost-effective, attractive, and environmentally compatible way to construct slopes and other landforms that are stable and that blend in with the natural surroundings. Use of these principles would ensure restoration of dendritic ephemeral drainages and result in a more varied, natural-looking topography. Alternative 2 would require that the applicant use digital terrain modeling to document and restore the premining surface configuration. It also would require use of digital terrain modeling during backfilling and grading and upon completion of final grading to document restoration of the approved final surface configuration.

Under this Alternative, the regulatory authority would determine the allowable deviation in the elevation of the backfilled and graded area postmining in comparison to the premining elevation based on the lowest coal seam mined. The allowable deviation in the postmining elevation could be no more than ±20 percent of the difference between the premining surface elevation and the premining bottom elevation of that lowest coal seam, with allowances for slope stability and minor shifts in the location of premining features. This tolerance would apply only to those portions of the mine site that are subject to the AOC restoration requirement; e.g., the tolerance would not apply to excess spoil fills or coal mine waste disposal facilities.

AOC restoration requirements for steep-slope mining permits would allow the placement of what would otherwise be excess spoil on the mined-out area to heights in excess of the premining elevation if safety and stability requirements were met, and if the final surface configuration would be compatible with the surrounding terrain and consistent with natural premining landforms. This exemption would allow the permittee to exceed premining elevations and otherwise applicable tolerances to achieve the desired topography and would minimize the need to place excess spoil in streams.

Compliance with the ±20 percent tolerance is not practicable in contour mining on steep slopes (defined as slopes greater than 20 degrees) because of stability and equipment constraints. Therefore, the ±20

percent tolerance requirement does not apply to that portion of a contour mine permit where steep-slope mining is conducted. The tolerance and digital terrain modeling requirements also would not apply to remining sites, permits 40 acres or smaller in size, or operations that qualify for the thin overburden standards of 30 CFR 816.104.

This Alternative would allow permanent impoundments, including final-cut impoundments, provided they would not otherwise create conflicts with achieving AOC and they met the approved postmining land use. This Alternative would encourage the construction of aquitards within the backfill to act as a barrier to groundwater infiltration and to facilitate stream construction. Placement of a layer of lower-permeability spoil or other material near the surface but below the root zone for trees and shrubs could provide the subsurface flow needed to restore flow in intermittent and ephemeral stream segments.

Alternative 2 would prohibit flat decks on excess spoil fills and coal waste disposal facilities.

2.4.2.3.2 AOC Exceptions

Alternative 2 would eliminate all exceptions from the requirement to return the mined area to its approximate original contour. Thus, Alternative 2 would preclude both mountaintop removal mining operations and AOC variances for steep-slope mining operations. Implementing this Alternative could require an amendment to SMCRA.

2.4.2.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.2.4.1 Revegetation, Reforestation and Topsoil Management

Alternative 2 includes provisions similar to those of the No Action Alternative with respect to soil management and revegetation, but with a greater emphasis on restoration of the site's ability to support the uses it supported before any mining, regardless of the approved postmining land use. Alternative 2 also places greater emphasis on construction of a growing medium with an adequate root zone for deep-rooted species and on revegetation with native tree and plant species, especially reforestation of previously forested areas.

Like the No Action Alternative, Alternative 2 requires salvage and redistribution of all topsoil (the A and E soil horizons). However, it also requires salvage and redistribution of the B and C soil horizons (or other suitable overburden materials) to the extent necessary to achieve a growing medium with the optimal rooting depths required to restore premining land use capability or comply with revegetation requirements. Under the No Action Alternative, the regulatory authority has the discretion, but not necessarily the obligation, to require salvage and redistribution of the B and C soil horizons or other suitable overburden materials.

Alternative 2 allows use of selected overburden materials as substitutes for (or supplements to) either topsoil or subsoil or both only if the applicant demonstrates that either (1) the quality of the existing topsoil and subsoil is inferior to that of other overburden materials or (2) the quantity of the existing topsoil and subsoil is insufficient to provide the optimal rooting depth or meet other plant growth requirements. In the latter case, all existing topsoil and favorable subsoil must be salvaged and redistributed together with the substitute material. As in the No Action Alternative, the applicant also must demonstrate that the resulting soil medium will be more suitable than the existing topsoil and

subsoil to sustain vegetation and that the selected overburden materials are the best available within the permit area for that purpose. Alternative 2 differs slightly from the No Action Alternative in that the No Action Alternative allows the use of topsoil substitutes or supplements when the resulting soil medium will be equally or more suitable than the existing topsoil to sustain vegetation, while Alternative 2 allows their use only when the resulting soil medium will be more suitable to sustain vegetation.

Under Alternative 2, the permittee must salvage and redistribute all organic matter (duff, other organic litter, and vegetative materials such as tree tops, small logs, and root balls) above the A soil horizon to increase the moisture retention capability of the soil and provide a source of the seeds, plant propagules, mycorrhizae, and other soil flora and fauna needed to support and enhance reestablishment of locally adapted and genetically diverse plant communities as well as to improve soil productivity. Alternative 2 prohibits burning or burying vegetation or other organic materials.

Under Alternative 2 the permittee must reforest lands that were previously forested, or that would naturally revert to forest under conditions of natural succession, in a manner that would enhance recovery of the native forest ecosystem as expeditiously as possible. Prime farmland is exempt from this requirement.

The permittee must revegetate the entire reclaimed area (other than water areas and impervious surfaces like roads and buildings) using native species to restore or reestablish the plant communities native to the area unless a conflicting postmining land use is actually implemented before the end of the revegetation responsibility period.

2.4.2.4.2 Fish and Wildlife Protection and Enhancement

Alternative 2 would require incorporation of any Clean Water Act mitigation plan for the operation as a condition of the SMCRA permit. Bond release under SMCRA could not occur until completion of successful mitigation as determined by the regulatory authority and the agency implementing the Clean Water Act. Implementing this Alternative could require an amendment to SMCRA.

Alternative 2 is similar to the No Action Alternative with respect to the protection of threatened and endangered species. However, Alternative 2 would codify the dispute resolution provisions of the 1996 biological opinion concerning protection of threatened and endangered species. It also would expressly require that the fish and wildlife protection and enhancement plan in the permit application include any species-specific protective measures developed in accordance with the Endangered Species Act and any biological opinions implementing that law.

Alternative 2 is similar to the No Action Alternative with respect to the fish and wildlife resource information and protection and enhancement plan required in the permit application. It also includes similar performance standards for protection of fish and wildlife. The principal difference is that Alternative 2 would require creation of a streamside vegetative corridor at least 100 feet in width, comprised of native non-invasive species, along the entire reach of any ephemeral, intermittent, or perennial streams that are restored or permanently diverted.

2.4.3 Alternative 3

Alternative 3 differs from Alternative 2 in that it would prohibit the placement of excess spoil or coal mine waste in perennial streams, but not in intermittent streams. Otherwise, Alternative 3 contains no categorical prohibition on mining activities in or near perennial, intermittent, or ephemeral streams.

2.4.3.1 Protection of the Hydrologic Balance

2.4.3.1.1 Baseline Data Collection and Analysis

Same as Alternative 2 (see Baseline Data Collection and Analysis section for Alternative 2), except that Alternative 3 would require discrete measurement of streamflow and groundwater levels whereas Alternative 2 would require continuous measurements.

2.4.3.1.2 Monitoring During Mining and Reclamation

Under Alternative 3, all monitoring requirements are the same as under Alternative 2 (see Monitoring During Mining and Reclamation section for Alternative 2), with the exception of precipitation monitoring. In that case, the engineer would be required to conduct an inspection of the surface water runoff control system after each storm event with a two-year or greater recurrence-interval, rather than after each storm event with a one-year or greater recurrence interval as under Alternative 2.

2.4.3.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Same as Alternative 2 (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 2).

2.4.3.1.4 Evaluation Thresholds

Same as Alternative 2 (see Evaluation Thresholds section for Alternative 2).

2.4.3.2 Activities in or Near Streams

2.4.3.2.1 Stream Definitions

Same as the No Action Alternative (see Stream Definitions section for Alternative 1).

2.4.3.2.2 Activities In or Near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

Same as Alternative 2 except that Alternative 3 would allow the placement of excess spoil in intermittent streams. Alternative 3 lacks Alternative 2's categorical prohibition on mining activities in or near perennial streams, but it would prohibit the construction of excess spoil fills and coal mine waste disposal facilities in perennial streams. Alternative 3 would require that the permittee establish permanent streamside vegetative corridors along the banks of restored or diverted perennial or intermittent stream channels, but, unlike Alternative 2, it would not require establishment of streamside vegetative corridors along the banks of restored or diverted ephemeral streams. Alternative 3 would require that the streamside vegetative corridor be at least 300 feet in width, compared to the minimum 100-foot width under Alternative 2. Unlike Alternative 2, Alternative 3 would not require that the SMCRA permit incorporate any mitigation plan under section 404 of the Clean Water Act. Alternative 3 would also allow

the permittee to construct excess spoil fills with flat decks, rather than requiring the use of landforming principles as under Alternative 2.

2.4.3.2.3 Mining Through Streams

Same as Alternative 2, except that Alternative 3 would not prohibit mining through perennial streams. Nor would it require the regulatory authority to make special findings for mining through ephemeral streams, although it would require the permittee to restore the hydrologic function of ephemeral streams to the extent required by geomorphic reclamation principles.

2.4.3.3 AOC and AOC Variances

2.4.3.3.1 Surface Configuration

Same as Alternative 2, except that Alternative 3 would not include any numerical limits or tolerances on differences between premining and postmining elevations. In addition, there is no requirement to use landforming principles on the surface of excess spoil fills.

2.4.3.3.2 AOC Variances

Alternative 3 would allow mountaintop removal mining operations and AOC variances for steep-slope mining operations under conditions generally similar to those in the No Action Alternative. However, Alternative 3 would impose additional requirements to better protect streams, aquatic ecology, and biological communities. In addition, it would require that the permittee post bond in an amount sufficient to return the site to AOC if the permittee has not implemented the approved postmining land use before expiration of the revegetation responsibility period.

For approval of mountaintop removal mining operations, Alternative 3 would require the permit applicant to demonstrate that:

No damage would result to natural watercourses within the proposed permit and adjacent areas;

- There would be no adverse changes in parameters of concern in discharges to surface water and groundwater;
- No change would occur in the size or frequency of peak flows as compared to the peak flows that would occur if the permittee mined the site and restored it to AOC; and that
- The total volume of flow during any season of the year would not vary; i.e., there would be no change in the seasonal flow regime and no increase in potential damage from flooding.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application, unless reforestation would be inconsistent with the postmining land use.

Finally, the permittee must install drains through the outcrop barrier to prevent saturation of the backfill.

For approval of steep-slope variances, Alternative 3 would require permit applicants to demonstrate each of the following:

- The operation, including any fish and wildlife enhancement measures, will result in fewer adverse impacts to the aquatic ecology of the cumulative impact area than would occur if the site were mined and restored to AOC;
- Surface-water flow in the watershed would be improved over both premining conditions and conditions that would exist if the area were mined and restored to AOC;
- The variance would not result in construction of an excess spoil fill in an intermittent or perennial stream; and
- Any deviations from the premining surface configuration are necessary and appropriate to achieve the postmining land use.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application or would revert to forest under natural succession. This requirement would not apply to permanent impoundments, roads, and other impervious surfaces to be retained following mining and reclamation or to those portions of the permit area covered by the variance.

2.4.3.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.3.4.1 Revegetation, Reforestation and Topsoil Management

Alternative 3 has the same requirements for soil management and revegetation as Alternative 2, except that Alternative 3 requires salvage and redistribution of all organic matter (duff, other organic litter, and vegetative materials such as treetops, small logs, and root balls) from native species in accordance with an approved plan developed by a qualified ecologist or similar expert. The plan would specify the amount of organic materials the permittee must retain and redistribute to promote reestablishment of native vegetation and soil flora and fauna. Alternative 3 prohibits the burning of native vegetation and vegetative debris, but, unlike Alternative 2, it would allow the permittee to bury these materials.

2.4.3.4.2 Fish and Wildlife Protection and Enhancement

Alternative 3 is similar to the No Action Alternative with respect to the protection of threatened and endangered species. However, Alternative 3 would codify the dispute resolution provisions of the 1996 biological opinion concerning protection of threatened and endangered species. It also would expressly require that the fish and wildlife protection and enhancement plan in the permit application include any species-specific protection and enhancement plans developed in accordance with the Endangered Species Act and any biological opinions implementing that law.

Alternative 3 is similar to the No Action Alternative with respect to the fish and wildlife resource information and protection and enhancement plan required in the permit application. It also includes similar performance standards for protection of fish and wildlife. However, Alternative 3 would require that the permittee establish permanent streamside vegetative corridors at least 300 feet wide, comprised of native, non-invasive species, along the banks of restored or diverted perennial or intermittent stream channels. The permittee must use appropriate species of woody plants if the land would naturally revert to forest under natural succession.

In addition, fish and wildlife enhancement measures would be mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant communities, or filling of a segment of an intermittent stream. The enhancement measures must be commensurate with

the long-term adverse impact to the affected resources and they must be located in the same watershed as the proposed operation (or the nearest appropriate adjacent watershed if there are no opportunities for enhancement within the same watershed). The permit area would include these areas of enhancement.

Finally, Alternative 3 would allow the regulatory authority to prohibit mining of high-value habitats within the proposed permit area.

2.4.4 Alternative 4

Alternative 4 is similar to Alternative 2 except that it would have slightly more relaxed requirements for the collection of baseline data and monitoring, it would define streams based on different criteria than Alternative 2, and it would be more permissive than Alternative 2 in activities in or near streams, and mining through streams.

However, Alternative 4 would impose additional permitting requirements on operations involving factors that OSMRE has determined pose additional risk to the environment and warrant enhanced permitting requirements. These operations are as follows:

- Surface mining activities (including surface activities of underground mining) in pristine or unique hydrologic environments (any unique historic, hydrologic, geologic, or other natural areas, with a special designation status). Examples include state-designated High-Quality or Exceptional streams and any stream with an elevated Clean Water Act use designation. Other examples include mine sites situated within or adjacent to designated natural, wild, or wilderness areas; or local, state, or national parks;
- Operations in strata that have been known to produce acid or toxic mine drainage to ensure that mining and reclamation can be accomplished such that active or postmining water quality does not cause material damage to the hydrologic balance outside the permit area;
- Mining operations in watersheds with impaired waters or streams when the regulatory authority expects that the coal mining activity would exacerbate the conditions of the parameter(s) causing the impairment;
- Proposed operations on steep slopes (areas with slopes greater than 20 degrees on more than 10 percent of the proposed disturbed acreage); or
- Operations that propose to place excess spoil or coal mine waste in intermittent or perennial streams or their buffer zones.

When the proposed mining activity includes any of these listed operations in all or part of the permit area certain additional permitting requirements would apply over the entire permit area. The regulatory authority would identify the additional requirements[23] specific to a proposed operation. The regulatory authority could modify or expand these requirements as needed to address the needs of a particular operation. For example, under this Alternative the regulatory authority could require any or all of the following when enhanced permitting design was warranted:

[23] The additional permitting and implementation costs on the operator, and the additional permit review and inspection effort for the regulatory authority, associated with the listed examples were accounted for in the economic analysis of the FEIS and in the RIA.

- Additional detail in the analysis of the receiving watershed including the location and type of current and past disturbances in the watershed and other activities that may affect water quality;
- Measured stream flows and recorded storm hydrographs to develop premining hydrologic models;
- Modeling of seasonal groundwater fluctuations. Analysis of the correlation between groundwater fluctuations, precipitation events and groundwater quality;
- Establishment of clear environmental goals for the proposed operation. Use of background data and a detailed mine plan to demonstrate how environmental goals would be achieved;
- Development of reclamation goals specific to the proposed operation and the site conditions that would include planning for timely redistribution of topsoil and organics, contemporaneous plantings, and any related actions that would help reduce water quality degradation from the proposed operation;
- Additional detail in the mine plan to show changes in 6-month increments, specific to disturbed and reclaimed areas, roads, sediment controls, topsoil storage, fills, Best Management Practices (BMPs) etc.;
- Use of premining hydrologic models to assess flood potential and need for flood control, to project sediment loads and determine the design criteria for sediment control structures and need for temporary sediment controls; and/or
- Use of on-bench ponds, where possible, in conjunction with in-stream ponds below placement of fill. Design of on-bench ponds to accommodate both a full sediment load and maintenance of a low permanent pool to allow recirculation from in-stream ponds as needed.

The text below discusses Alternative 4 proposed requirements for each element. These requirements would apply to all operations, including those involving enhanced permitting (at a minimum).

2.4.4.1 Protection of the Hydrologic Balance

2.4.4.1.1 Baseline Data Collection and Analysis

Alternative 4 would require the same baseline data collection and analysis as Alternative 2 (see Baseline Data Collection and Analysis section for Alternative 2), except that Alternative 4 requires discrete, rather than continuous measurements of streamflow and groundwater levels.

2.4.4.1.2 Monitoring During Mining and Reclamation

Under Alternative 4, all monitoring requirements are the same as under Alternative 2 (see Monitoring During Mining and Reclamation section for Alternative 2), with the exception of precipitation monitoring. Under Alternative 4 the engineer would be required to conduct an inspection of the surface water runoff control system after each storm event with a two-year or greater recurrence-interval, rather than after each storm event with a one-year or greater recurrence interval as under Alternative 2.

2.4.4.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Same as Alternative 2 (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 2).

2.4.4.1.4 Evaluation Thresholds

Same as Alternative 2 (see Evaluation Thresholds section for Alternative 2).

2.4.4.2 Activities in or Near Streams

2.4.4.2.1 Stream Definitions

Alternative 4 defines perennial, intermittent, and ephemeral streams in terms of flow regime, channel and substrate characteristics, and the biological community, if any, found in the stream. The definition of an intermittent stream would no longer include the one-square-mile watershed criterion.

The definitions of each stream type would be as follows:

- Ephemeral stream means a stream or segment of a stream with the following characteristics:
  - A defined channel and an identifiable streambed are present. The channel contains an ordinary high-water mark and the channel bottom is always above both the water table associated with the regional aquifer and any perched water-bearing zones.
  - Water flows in the channel only in direct response to discrete precipitation events or in response to the melting of snow and ice. Groundwater discharges and discharges from perched water-bearing zones above the water table are not a source of streamflow.
  - An ephemeral stream typically lacks the hydrological, and physical characteristics commonly associated with the continuous or seasonal conveyance of water.

- Intermittent stream means a stream or segment of a stream with the following characteristics:
  - A defined channel and an identifiable streambed are present. The channel contains an ordinary high-water mark and the channel bottom is below the water table associated with the regional aquifer or a perched water-bearing zone for at least part of the year.
  - Water flows in the channel for only part of the year, with those flows originating from both surface runoff and either groundwater discharge or a discharge from a perched water-bearing zone above the water table.
  - The hydrological, and physical characteristics commonly associated with the seasonal conveyance of water are present, while the hydrological, and physical characteristics commonly associated with the continuous conveyance of water typically are absent.
- Perennial stream means a stream or segment of a stream with the following characteristics:
  - A defined channel and an identifiable streambed are present. The channel includes an ordinary high-water mark.
  - In a typical year, water flows continuously in the channel during the entire calendar year as a result of both surface runoff and groundwater discharge. The term does not include any stream or segment of a stream that meets the definition of an intermittent stream or an ephemeral stream, but it does include stream segments in which continuous flow ceases because of a protracted period of deficient precipitation or meltwater relative to historical norms, as determined under § 780.19(c) or § 784.19(c) of this chapter.
  - The hydrological, and physical characteristics commonly associated with the continuous conveyance of water are present.

2.4.4.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

Alternative 4 would be the same as Alternative 2, except that Alternative 4 lacks Alternative 2's categorical prohibition on mining activities in or near perennial streams, and it would not prohibit the placement of excess spoil in intermittent streams. Similar to Alternative 2, Alternative 4 would require the permittee to establish permanent streamside vegetative corridors along both banks of the entire reach of restored or diverted perennial or intermittent stream channels, but it would not require establishment of streamside vegetative corridors along the banks of restored or diverted ephemeral streams. Alternative 4 would require that the streamside vegetative corridor be at least 300 feet in width, compared to the minimum 100-foot width under Alternative 2. Unlike Alternative 2, Alternative 4 would not require that the SMCRA permit incorporate any mitigation plan under section 404 of the Clean Water Act.

2.4.4.2.3 Mining Through Streams

Same as Alternative 2, except as described in the Activities in or near Streams section for Alternative 4 above. Unlike Alternative 2, Alternative 4 would not prohibit mining through perennial streams. Nor would it require the regulatory authority to make special findings to approve mining through ephemeral streams. It would require restoration of the hydrologic function of ephemeral streams only to the extent required by geomorphic reclamation principles.

2.4.4.3 AOC and AOC Variances

2.4.4.3.1 Surface Configuration

Same as Alternative 2 (see Surface Configuration section for Alternative 2).

2.4.4.3.2 AOC Variances

Same as Alternative 3 (see AOC Variances section for Alternative 3) for all operations.

2.4.4.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.4.4.1 Revegetation, Reforestation and Topsoil Management

Same as Alternative 2 (see Revegetation, Reforestation and Topsoil Management section for Alternative 2) for all operations.

2.4.4.4.2 Fish and Wildlife Protection and Enhancement

Same as Alternative 3 (see Fish and Wildlife Protection and Enhancement section for Alternative 3) for all operations.

2.4.5 Alternative 5

This Alternative applies to surface and underground coal mining operations that would generate or dispose of excess spoil or coal mine waste outside the mined-out area, including the storage of material resulting from the creation of the face-up area for an underground mine. It also applies to all operations that would dispose of coal mine waste in perennial or intermittent streams. This Alternative would apply to the entire permit area whenever any portion of the operation met the criteria set forth above. It would

also apply to contiguous permits if they were operated as a single operation with a permit that met the criteria.

However, this Alternative would not apply to any operation that would otherwise not meet the criteria set forth above. These operations would remain under the existing requirements of Alternative 1 (the No Action Alternative).

2.4.5.1 Protection of the Hydrologic Balance

2.4.5.1.1 Baseline Data Collection and Analysis

Same as Alternative 2 (see Baseline Data Collection and Analysis section for Alternative 2), with the exception that discrete measurements of streamflow and groundwater levels would be required as in Alternative 4.

2.4.5.1.2 Monitoring During Mining and Reclamation

Under Alternative 5, all monitoring requirements are the same as under Alternative 2 (see Monitoring During Mining and Reclamation section for Alternative 2), with the exception of precipitation monitoring. In that case, the engineer would be required to conduct an inspection of the surface water runoff control system after each storm event with a two-year or greater recurrence-interval, rather than after each storm event with a one-year or greater recurrence interval as under Alternative 2.

2.4.5.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Same as the No Action Alternative (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 1).

2.4.5.1.4 Evaluation Thresholds

Same as the No Action Alternative (see Evaluation Thresholds section for Alternative 1).

2.4.5.2 Activities in or Near Streams

2.4.5.2.1 Stream Definitions

Same as the No Action Alternative (see Stream Definitions section for Alternative 1).

2.4.5.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

Same as Alternative 2, except that Alternative 5 lacks Alternative 2's categorical prohibition on mining activities in or near perennial streams and it would not prohibit the placement of excess spoil in intermittent streams. Unlike Alternative 2, Alternative 5 would not require that the SMCRA permit incorporate any mitigation plan under section 404 of the Clean Water Act.

2.4.5.2.3 Mining Through Streams

Same as Alternative 2, except as described in the Activities in or near Streams section for Alternative 5 above. Unlike Alternative 2, Alternative 5 would not prohibit mining through perennial streams. Nor would it require special findings for mining through ephemeral streams, although it requires restoration of the hydrologic function of ephemeral streams to the extent required by geomorphic reclamation.

2.4.5.3 AOC and AOC Variances

2.4.5.3.1 Surface Configuration

Same as Alternative 2 (see Surface Configuration section for Alternative 2), except that Alternative 5 does not require the use of landforming principles. Nor would it establish any numerical limits or tolerances with respect to the extent to which the postmining elevation may differ from the premining elevation. Alternative 5 would require the permittee to return as much spoil material to the mined-out area as possible to minimize the need for and creation of excess spoil fills.

2.4.5.3.2 AOC Variances

Same as Alternative 3 (see AOC Variances section for Alternative 3).

2.4.5.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.5.4.1 Revegetation, Reforestation and Topsoil Management

Same as Alternative 3 (see 2.4.3.4 - Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement for Alternative 3).

2.4.5.4.2 Fish and Wildlife Protection and Enhancement

Same as Alternative 3 (see 2.4.3.4 - Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement for Alternative 3).

2.4.6 Alternative 6

This Alternative is limited to mining activities conducted in intermittent or perennial streams or within 100 feet of those streams. It would prohibit all mining activities within those areas unless the regulatory authority makes specific findings concerning the environmental impacts of the proposed operation. Alternative 6 would be the same as Alternative 1 (the No Action Alternative) for mining activities on all other areas of the permit, with the exceptions of new requirements proposed for baseline data collection and monitoring as described below.

2.4.6.1 Protection of the Hydrologic Balance

2.4.6.1.1 Baseline Data Collection and Analysis

Same as Alternative 2 (see Baseline Data Collection and Analysis section for Alternative 2).

2.4.6.1.2 Monitoring During Mining and Reclamation

Same as Alternative 2 (see Monitoring During Mining and Reclamation section for Alternative 2).

2.4.6.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area (Alternative limited to the Enhanced Stream Buffer Zone)

Same as Alternative 1, the No Action Alternative (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 1).

2.4.6.1.4 Evaluation Thresholds Alternative limited to the Enhanced Stream Buffer Zone)

Same as Alternative 1, the No Action Alternative (see Evaluation Thresholds section for Alternative 1).

2.4.6.2 Activities in or Near Streams

2.4.6.2.1 Stream Definitions

Same as Alternative 1, the No Action Alternative (see Stream Definitions section for Alternative 1).

2.4.6.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

Alternative 6 would prohibit mining activities in or within 100 feet of perennial and intermittent streams unless the applicant demonstrates each of the following:

- The ecological function of the stream would be protected or restored;
- Placement of excess spoil or coal mine waste within that area would not result in the formation of toxic mine drainage as that term is defined at 30 CFR 701.5;
- Long-term adverse impacts, including impacts within the footprint of any fill, to the environmental resources of the stream would be offset through fish and wildlife enhancement measures in the same or an adjacent watershed;
- Mining activities to be conducted within 100 feet of the stream, but not in the stream itself, would not adversely affect the water quality or quantity or other environmental resources of the stream; and
- The revegetation plan requires establishment of a permanent streamside vegetative corridor at least 100 feet in width along the entire reach of any restored or permanently diverted perennial, intermittent, or ephemeral stream segment.

Alternative 6 would require the mining operation design to minimize the generation of excess spoil. It also requires the design of excess spoil fills and coal mine waste disposal facilities to minimize their footprints. The intent of both requirements is to reduce the length of stream that the operation would cover.

Each applicant proposing to place excess spoil or coal mine waste in an intermittent or perennial stream or within 100 feet of such a stream must identify and analyze a range of reasonable operational alternatives. The applicant must select the alternative that would have the least adverse impact of all reasonable operational alternatives on fish, wildlife, and related environmental values.

Under Alternative 6, the permittee must construct any excess spoil fills in lifts not to exceed four feet in thickness. Alternative 6 would eliminate the current regulation at 30 CFR 816.73, which allows construction of durable rock fills that rely upon end-dumping and the construction of underdrains by gravity segregation of the end-dumped material. This Alternative would require daily monitoring during

excess spoil placement. It would revise the existing rules to require that the quarterly inspection reports filed with the regulatory authority include the daily monitoring logs.

Alternative 6 would allow construction of excess spoil fills with flat decks on top, and includes no landforming requirements for excess spoil fills.

2.4.6.2.3 Mining Through Streams

Same as Alternative 2, except that Alternative 6 would not prohibit mining through perennial streams. Nor would it require the regulatory authority to make special findings for mining through ephemeral streams, although it would require the permittee to restore the hydrologic function of ephemeral streams to the extent required by geomorphic reclamation principles. In addition, it would require the permittee to establish a streamside vegetative corridor at least 100 feet in width along the entire reach of all streams, including ephemeral streams, within the permit area after completing mining.

2.4.6.3 AOC and AOC Variances

2.4.6.3.1 Surface Configuration

Same as Alternative 1, the No Action Alternative (see Surface Configuration section for Alternative 1).

2.4.6.3.2 AOC Variances

Same as Alternative 1, the No Action Alternative (see AOC Variances section for Alternative 1).

2.4.6.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.6.4.1 Revegetation, Reforestation and Topsoil Management

Same as Alternative 1, the No Action Alternative (see Revegetation, Reforestation and Topsoil Management section for Alternative 1).

2.4.6.4.2 Fish and Wildlife Protection and Enhancement

Same as Alternative 1, the No Action Alternative, with the exceptions discussed below.

Alternative 6 would require that the permittee establish permanent streamside vegetative corridors at least 100 feet wide, comprised of native, non-invasive species, along both banks of all perennial, intermittent, and ephemeral stream segments within the permit area after the completion of mining. The permittee must use appropriate species of woody plants to reforest the site if the site would naturally revert to forest under natural succession.

In addition, fish and wildlife enhancement measures are mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant communities, or filling of a segment of a perennial or intermittent stream. The enhancement measures must be commensurate with the long-term adverse impact to the affected resources and they must be located in the same watershed as the proposed operation (or the nearest appropriate adjacent watershed if there are no opportunities for enhancement within the same watershed). The areas upon which the enhancement measures are conducted must be included within the permit area.

Finally, Alternative 6 would allow the regulatory authority to prohibit mining of high-value habitats within the proposed permit area.

2.4.7 Alternative 7

Similar to Alternative 4, this Alternative would impose additional requirements (see 2.4.4 – Alternative 4) on the operations OSMRE has identified as warranting enhanced permitting. For these operations, Alternative 7 would also include new requirements based on the elements as discussed below.

All other operations (i.e. those that did not fall under the list of operations identified as warranting enhanced permitting) would continue to fall under the existing regulations of the No Action Alternative.

2.4.7.1 Protection of the Hydrologic Balance

2.4.7.1.1 Baseline Data Collection and Analysis

Same as Alternative 2 (see Baseline Data Collection and Analysis section for Alternative 2), but would apply only when the specified conditions exist that warrant enhanced permitting conditions. Otherwise baseline data collection and analysis requirements would be the same as the No Action Alternative (see Baseline Data Collection and Analysis section for Alternative 1).

2.4.7.1.2 Monitoring During Mining and Reclamation

Same as Alternative 2 (see Monitoring During Mining and Reclamation section for Alternative 2), but would apply only when the specified conditions exist that warrant enhanced permitting conditions. Otherwise baseline data collection and analysis requirements would be the same as the No Action Alternative (see Monitoring During Mining and Reclamation section for Alternative 1).

2.4.7.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Same as the No Action Alternative (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 1). OSMRE would expect each regulatory authority to establish criteria to measure material damage to the hydrologic balance for purposes of cumulative hydrologic impact assessments.

2.4.7.1.4 Evaluation Thresholds

In areas subject to enhanced permitting requirements, Alternative 7 would require the regulatory authority to develop evaluation thresholds. For these areas, the regulatory authority would be required to establish evaluation thresholds for critical parameters centered on baseline data, and associated conditions, and the analysis conducted for the Cumulative Hydrologic Impact Assessment (CHIA). The regulatory authority would define these thresholds based on the degree of environmental degradation that would require evaluation before the operation causes material damage to the hydrologic balance outside the permit area. The permittee would be required to conduct a water quality trend analysis of the monitoring data on a quarterly basis to determine environmental impacts from the site. If the analysis indicates that values or trends in values, for any surface water or groundwater parameter have reached the evaluation threshold specified in the permit, the permittee must notify the regulatory authority and evaluate the conditions that caused the threshold parameter to be met or exceeded. If the permittee finds, and the regulatory authority agrees, that the increase is due to the permittee's mining activity, then the operator must develop and

implement corrective measures to ensure that material damage to the hydrologic balance outside the permit area does not occur. The requirement to take evaluation would not apply if the permittee demonstrates, and the regulatory authority concurs in writing, that the adverse values or trends for the parameters of concern are not the result of the mining operation.

2.4.7.2 Activities in or Near Streams

2.4.7.2.1 Stream Definitions

Same as the No Action Alternative, except that Alternative 7 would remove the one-square-mile criterion in the existing definition of an intermittent stream.

Alternative 7 would require coordination with the Clean Water Act authority on defining stream flow condition. Both the permit applicant and the regulatory authority must seek input from the Clean Water Act Authority for all new applications, and incorporate where applicable all CWA authority concerns and criteria.

2.4.7.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

In areas warranting enhanced permitting requirements, Alternative 7 would place the same new limitations and requirements on activities in or near streams as would Alternative 2 (see Activities in or near Streams section for Alternative 2). For all other operations, the requirements of the No Action Alternative (see Activities in or near Streams section for Alternative 1) would continue to apply.

2.4.7.2.3 Mining Through Streams

In areas warranting enhanced permitting requirements, this Alternative would place the same limitations and requirements on mining through streams as Alternative 2 (see Mining Through Streams section for Alternative 2). In these areas, Alternative 7 would allow mining through intermittent streams upon demonstration that: (1) the reclamation plan would result in restoration of both the physical form and the hydrologic and ecological function; (2) the extent of the mine-though would be minimized, and; (3) the bond includes separate calculations of the cost of restoration of both form and function. Also, the permittee would be required to reconstruct ephemeral streams (but not restore their ecological function) and to establish a 100-foot streamside vegetative corridor along the entire reach (including ephemeral) of any restored stream.

In all other areas outside those warranting the enhanced permitting conditions, the current requirements of the No Action Alternative (see Mining Through Streams section for Alternative 1) would continue to apply.

2.4.7.3 AOC and AOC Variances

2.4.7.3.1 Surface Configuration

In areas warranting enhanced permitting requirements, Alternative 7 would impose the same requirements as Alternative 2 (see Surface Configuration section for Alternative 2). In all other areas, the existing requirements of the No Action Alternative (see Surface Configuration section for Alternative 1) would continue to apply.

2.4.7.3.2 AOC Variances

Alternative 7 proposes no changes to the current regulations governing mountaintop removal mining operations and AOC variances for steep-slope mining operations. Requirements would be the same as they are under the No Action Alternative (see AOC Variances section for Alternative 1).

2.4.7.4 Revegetation, Topsoil, and Fish and Wildlife Protection and Enhancement

2.4.7.4.1 Revegetation, Reforestation and Topsoil Management

In areas subject to the enhanced permitting requirements, requirements for revegetation, topsoil management and reforestation would be the same as under Alternative 2 (see Revegetation, Reforestation and Topsoil Management section for Alternative 2). In all other areas, the existing requirements of the No Action Alternative (see Revegetation, Reforestation and Topsoil Management section for Alternative 1) would continue to apply.

2.4.7.4.2 Fish and Wildlife Protection and Enhancement

Under Alternative 7, for areas subject to the enhanced permitting requirements, the regulatory authority may prohibit mining of areas where high value habitats are present. All other requirements for fish and wildlife protection and enhancement within these areas would be the same as Alternative 3 (see Fish and Wildlife Protection and Enhancement section for Alternative 3) except that under Alternative 7 the required streamside vegetative corridor width would be 100 feet versus 300 under Alternative 3.

2.4.8 Alternative 8 (Preferred)

This Alternative is primarily comprised of selected stream protection elements (as indicated below) of the other Action Alternatives analyzed.

2.4.8.1 Protection of the Hydrologic Balance

2.4.8.1.1 Baseline Data Collection and Analysis

- Surface water: The applicant must provide surface-water quantity descriptions for perennial and intermittent streams within the proposed permit and adjacent areas. The applicant must collect these surface water samples for 12 consecutive months at approximately equally spaced monthly intervals. Under the final version of the Preferred Alternative, OSMRE has revised the collection requirements (since initially proposed) to allow the applicant to modify the interval between samples to allow for adverse weather conditions that would make it unsafe to travel to sampling locations.
- Groundwater: The applicant must measure the levels of groundwater in perched, regional, and local aquifers within the proposed permit and adjacent areas at approximately equally spaced monthly intervals for a minimum of 12 consecutive months. As with surface waters under the final version of the Preferred Alternative, OSMRE has revised the requirements to allow the applicant to modify the interval between groundwater samples to allow for adverse weather conditions that would make it unsafe to travel to sampling locations. OSMRE has also revised this Alternative to allow the applicant, with regulatory authority approval, to measure groundwater levels on a quarterly basis instead of monthly, but this would extend the minimum data-gathering period to 24 consecutive months.

- Parameters: The applicant must analyze surface water and groundwater samples for the parameters set forth in Table 2.4-1 below. Under the final version of the Preferred Alternative, OSMRE deleted the six parameters (ammonia, arsenic, cadmium, copper, nitrogen, zinc) that OSMRE had added to the Proposed Rule at EPA's request. Our research found that those parameters have little or no nexus to coal mining. Instead, they appear to relate to placement of coal combustion residues in mines, which is the subject of a separate rulemaking. However, in response to a comment, OSMRE added temperature as a mandatory baseline data collection and monitoring parameter for both surface water and groundwater. OSMRE also added a requirement for the applicant to collect baseline (and monitoring) data for all parameters of concern, as determined by the regulatory authority, regardless of whether the regulations specifically identify those parameters.

Table 2.4-1. Core Baseline Water-Quality Data Requirements for Surface Water and Groundwater Under the Preferred Alternative

Parameter	Surface Water	Groundwater
pH	Yes	Yes
Specific conductance corrected to 25°C (conductivity)	Yes	Yes
Total dissolved solids	Yes	Yes
Total suspended solids	Yes	No
Hot acidity	Yes	Yes
Total alkalinity	Yes	Yes
Major anions (dissolved), including, at a minimum, bicarbonate, sulfate, and chloride	Yes	Yes
Major anions (total), including, at a minimum, bicarbonate, sulfate, and chloride	Yes	No
Major cations (dissolved), including, at a minimum, calcium, magnesium, sodium, and potassium	Yes	Yes
Major cations (total), including, at a minimum, calcium, magnesium, sodium, and potassium	Yes	No
Cation-anion balance of dissolved major cations and dissolved major anions	Yes	Yes
Any cation or anion that constitutes a significant percentage of the total ionic charge balance, but that was not included in the analyses of major anions and major cations	Yes	Yes
Iron (dissolved)	Yes	Yes
Iron (total)	Yes	No
Manganese (dissolved)	Yes	Yes
Manganese (total)	Yes	No
Selenium (dissolved)	Yes	Yes

Parameter	Surface Water	Groundwater
Selenium (total)	Yes	No
Any other parameter identified in any applicable National Pollutant Discharge Elimination System permit, if known at the time of application for the SMCRA permit	Yes	No
Temperature	Yes	Yes

- Form of streams: Under the final version of the Preferred Alternative, the applicant must provide a detailed description of stream channel characteristics for perennial and intermittent streams located within the proposed permit area. General descriptions of the channels are required for ephemeral streams located within the proposed permit area. OSMRE decided not to apply this requirement to streams within adjacent areas (as previously proposed under this Alternative) because it is only within the permit area that channel characteristics are likely to be altered by mining.
- Biological condition of streams: Under the final version of the Preferred Alternative, OSMRE has removed the requirement for measurement of the biological condition of ephemeral streams. For perennial streams, this Alternative requires use of a scientifically defensible bioassessment protocol that will provide index values for both stream habitat and aquatic biota based on the reference condition. The protocol must be accepted by the agencies responsible for implementing the Clean Water Act and it must require identification of benthic macroinvertebrates to the genus level where possible, otherwise to the lowest practical taxonomic level. The index values must be capable of being used to assess the capability of the stream to support its designated uses under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c). The same requirement applies to intermittent streams if scientifically defensible protocols have been developed for those streams. If no such protocols exist, this Alternative would require the baseline data to include a description of the biology of each intermittent stream within the proposed permit area and each intermittent stream in the adjacent area that could be affected by the proposed operation. The sampling protocol must be accepted by an agency responsible for implementing the Clean Water Act and it must identify benthic macroinvertebrates to the genus level where possible, otherwise to the lowest practical taxonomic level.
- Wetlands: Under the final version of the Preferred Alternative, OSMRE has added a requirement that the permit applicant identify the extent and quality of wetlands adjoining all streams within the proposed permit area, and wetlands adjoining perennial and intermittent streams that occur in adjacent areas.
- Precipitation: The Preferred Alternative requires the applicant to use continuous recording devices to record all precipitation and storm events to provide baseline data that is adequate to generate and calibrate a hydrologic model of the site. Under the Preferred Alternative, OSMRE is not adopting the proposed requirement that the regulatory authority extend the baseline data collection period if the Palmer Drought Severity Index for that period exceeded certain values. Historical data indicate that there are few 12-month periods in which the selected values would not exist for at least part of the time. Instead, the Preferred Alternative would require that the applicant identify the Palmer Drought Severity Index values for the period during which baseline data were collected. The regulatory authority then would have the discretion to determine

whether and how long to extend the baseline data collection period under conditions of extreme drought or abnormally high precipitation.

- Geology: Requires collection of geologic data for the proposed permit and adjacent areas, with a focus on geological characteristics and properties that influence the hydrologic regime or that could alter the availability or quality of groundwater and surface water.

2.4.8.1.2 Monitoring During Mining and Reclamation

As with the Preferred Alternative proposed in the DEIS, the Preferred Alternative continues to require monitoring of surface water and groundwater during mining and reclamation at least quarterly for the same parameters measured during baseline sampling at locations designated in the permit.

As revised, the Preferred Alternative requires the permittee to monitor the biological condition of perennial streams and intermittent streams for which scientifically defensible bioassessment protocols exist annually until final bond release.

The Preferred Alternative now contains an additional requirement that the regulatory authority establish threshold values for water quality and quantity parameters that, when exceeded, as documented by monitoring, would result in an evaluation by the regulatory authority and the Clean Water Act authority to determine the reason for the exceedance. If the evaluation determines that discharges from the mining operation were responsible for the exceedance and that exceedances are likely to reoccur in the absence of corrective action, the regulatory authority must issue a permit revision order requiring that the permittee reassess the determination of the probable hydrologic consequences of the operation (the PHC determination) and the hydrologic reclamation plan and develop measures to prevent material damage to the hydrologic balance outside the permit area. These are the corrective action thresholds that were proposed for other Alternatives at the DEIS stage, but not for the Preferred Alternative, and that OSMRE is now referring to as “evaluation thresholds” in response to comments.

The Preferred Alternative continues to require that the permittee collect on-site precipitation measurements using self-recording rain gauges. Precipitation records must be adequate to generate and calibrate a hydrologic model of the site in the event the regulatory authority requires modeling.

Under the final Preferred Alternative, OSMRE has clarified that the regulatory authority must reevaluate the cumulative hydrologic impact assessment (CHIA) at intervals not to exceed three years. This evaluation is required to determine whether the CHIA remains accurate and whether the material damage and evaluation thresholds in the CHIA and the permit are adequate to ensure that material damage to the hydrologic balance outside the permit area will not occur. This evaluation must include a review of biological and water monitoring data from both this operation and all other coal mining operations within the cumulative impact area.

The Preferred Alternative continues to require an inspection of the surface water runoff-control system following storm events that recur on a two-year or greater interval. The Preferred Alternative also continues to require the operator to submit a report after such an event that describes the performance of the hydraulic control structures, assesses and describes any potential material damage to the hydrologic balance, and addresses any remedial measures taken. In the Preferred Alternative, OSMRE has revised the requirement for how soon the regulatory authority must receive the report, from the previously proposed 48 hours to 30 days.

The Preferred Alternative continues to require that monitoring continue until final bond release. The regulatory authority may not approve a bond release application if an analysis of water monitoring data and other relevant information indicate that the operation is causing material damage to the hydrologic balance outside the permit area or is likely to do so in the future. Under this Alternative, OSMRE added a requirement for restoration of the hydrologic function of mined-through perennial and intermittent streams before the regulatory authority may approve a Phase II bond release application. As proposed, the regulatory authority may not grant final Phase III bond release until the permittee demonstrates restoration of the ecological function of mined-through perennial and intermittent streams.

2.4.8.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

The Preferred Alternative in the DEIS defined material damage to the hydrologic balance outside the permit area as any adverse impact from surface or underground mining operations, including subsidence, on the quantity or quality of surface water or groundwater, or on the biological condition of a perennial or intermittent stream, that would preclude attainment or continuance of any designated surface water use under sections 101(a) and 303(c) of the Clean Water Act or any existing or reasonably foreseeable use of surface water or groundwater outside the permit area.

OSMRE has revised the Preferred Alternative definition of material damage to the hydrologic balance outside the permit area by removing all criteria and instead providing a list of factors that the regulatory authority, in consultation with the Clean Water Act authority, must consider in identifying material damage thresholds. Those factors include baseline data and reasonably anticipated or actual effects that the operation may have with respect to compliance with any applicable state or federal water quality standards and the Endangered Species Act of 1973, as well as the effects on premining uses of surface water and groundwater.

When selecting material damage thresholds, the revised Preferred Alternative requires that the regulatory authority, in consultation with the Clean Water Act authority as appropriate undertake a comprehensive evaluation that considers baseline data, the PHC determination, applicable water quality standards under the Clean Water Act, applicable state or tribal standards of surface water or groundwater, ambient water quality criteria developed under section 304(a) of the Clean Water Act, the biological requirements of species listed as threatened or endangered under the Endangered Species Act of 1973, and other pertinent information and considerations to identify the parameters for which thresholds are necessary. Thresholds may be either numeric or narrative, with the exception that, at the discretion of the Clean Water Act authority, numeric thresholds are required for relevant contaminants for which there are water quality criteria under the Clean Water Act, The intent of these changes is to ensure that the definition of this term does not foreclose the possibility of approving permits in watersheds with impaired streams, which could in turn drive mining into watersheds with higher quality streams.

2.4.8.1.4 Evaluation Thresholds

The Preferred Alternative within the DEIS did not include a requirement for specific evaluation thresholds. Instead, the Preferred Alternative relied on existing regulations that require permit applicants proposing to conduct surface or underground coal mining under § 780.21(h) or § 784.14(g) respectively, to provide a plan of measures the applicant would take to avoid adverse potential adverse hydrologic consequences, including preventative and remedial measures. The Preferred Alternative also relied on existing requirements at 30 CFR 816.41(c)(2) and (e)(2) and 817.41(c)(2) and (e)(2) that state that if

monitoring results demonstrate noncompliance with permit conditions or federal, state, or tribal water quality laws and regulations, the permittee must promptly notify the regulatory authority and then take all possible steps to minimize any adverse impact to the environment or public health and safety, and must immediately implement measures necessary to comply with permit conditions (30 CFR 773.17(e)).

In the Preferred Alternative OSMRE has added a requirement that the permit include evaluation thresholds for critical water quality and quantity parameters as determined by the regulatory authority. An exceedance of an evaluation threshold, as documented by monitoring, would result in an evaluation by the regulatory authority and the Clean Water Act authority to determine the reason for the exceedance. If the evaluation determines that discharges from the mining operation were responsible for the exceedance and that exceedances are likely to reoccur in the absence of corrective action, the regulatory authority must issue a permit revision order requiring that the permittee reassess the PHC determination and the hydrologic reclamation plan and develop measures to prevent material damage to the hydrologic balance outside the permit area.

2.4.8.2 Activities in or Near Streams

2.4.8.2.1 Stream Definitions

The Preferred Alternative as described in the DEIS redefines “perennial stream” in a manner that is substantively identical to the manner in which the U.S. Army Corps of Engineers (USACE) defines that term in Part F of the 2012 reissuance of the nationwide permits under section 404 of the Clean Water Act. See 77 FR 10184, 10288 (Feb. 21, 2012). In response to comments, OSMRE has revised the Preferred Alternative definitions of ephemeral, intermittent, and perennial streams to limit the scope of those terms to conveyances with channels that have a bed-and-bank configuration and an ordinary high water mark, consistent with the approach taken by the USACE in implementing section 404 of the Clean Water Act. This change means that our rules would no longer classify an ephemeral drainage that does not have a bed-and bank configuration and an ordinary high water mark as an ephemeral stream.

In the final version of the Preferred Alternative, OSMRE clarifies that a stream with a bed that is always above the water table and with flows arising solely from snowmelt and precipitation events would be classified as ephemeral. In the final version of the Preferred Alternative OSMRE has also replaced the term “waters of the United States” (WOTUS) with “perennial, intermittent, and ephemeral streams” or its equivalent in areas of the Proposed Rule that pertain only to streams. The change is non-substantive, but provides additional clarity. The final version of the Preferred Alternative includes the following stream definitions:

- Perennial stream means a stream or part of a stream that has flowing water year-round during a typical year. The water table is located above the streambed for most of the year. Groundwater is the primary source of water for streamflow. Runoff from rainfall events and snowmelt is a supplemental source of water for streamflow. Perennial streams include only those conveyances with channels that display both a bed-and-bank configuration and an ordinary high water mark.
- Intermittent stream means a stream or part of a stream that has flowing water during certain times of the year when groundwater provides water for streamflow. The water table is located above the streambed for only part of the year, which means that intermittent streams may not have flowing water during dry periods. Runoff from rainfall events and snowmelt is a supplemental

source of water for streamflow. Intermittent streams include only those conveyances with channels that display both a bed-and-bank configuration and an ordinary high water mark.

- Ephemeral stream means a stream or part of a stream that has flowing water only during, and for a short duration after, precipitation and snowmelt events in a typical year. Ephemeral streams include only those conveyances with channels that display both a bed-and-bank configuration and an ordinary high water mark, and that have streambeds located above the water table year-round. Groundwater is not a source of water for streamflow. Runoff from rainfall events and snowmelt is the primary source of water for streamflow.

2.4.8.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

In the DEIS, Alternative 8 (Preferred) would prohibit mining activities in or through perennial and intermittent streams or on the surface of land within 100 feet of those streams unless the applicant makes certain demonstrations and the regulatory authority makes the corresponding findings listed below, that the proposed activity would not—

(1) Preclude attainment or maintenance of any existing, reasonably foreseeable, or designated use under section 101(a) or 303(c) of the Clean Water Act, of the affected stream segment following the completion of mining and reclamation;

(2) Result in conversion of the stream segment from intermittent to ephemeral, from perennial to intermittent, or from perennial to ephemeral;

(3) Cause or contribute to a violation of federal, state, or tribal water quality standards; or

(4) Cause material damage to the hydrologic balance outside the permit area.

These requirements apply to all mining activities except the construction of excess spoil fills and coal mine waste disposal facilities that cover perennial or intermittent streams. (Excess spoil fills and coal mine waste disposal facilities that extend into the buffer zone, but not the stream itself, are not exempt.)

As revised, Alternative 8 (Preferred) would prohibit mining activities in or through perennial and intermittent streams or on the surface of land within 100 feet of those streams unless the applicant makes the demonstrations and the regulatory authority makes the corresponding findings in Table 2.4-2. Additional discussion of requirements regarding mining through streams is provided in the next section of text following the table.

Table 2.4-2. Required Demonstrations for Activities in or Within 100 Feet of a Perennial or Intermittent Stream

1		2	3	4
When indicated in columns 2 through 4 of this table, your application must contain the demonstrations in column 1 if you propose to conduct surface mining activities in or through a perennial or intermittent stream or on the surface of land within 100 feet of a perennial or intermittent stream.		Any activity other than an activity listed in column 3 or column 4	Mining through or permanently diverting a stream	Construction of an excess spoil fill, coal mine waste refuse pile, or impounding structure that encroaches upon any part of a stream
(i)	The proposed activity would not cause or contribute to a violation of applicable water quality standards adopted under the authority of section 303(c) of the Clean Water Act, 33 U.S.C. 1313(c), or other applicable state or tribal water quality standards.	Yes	Yes	Yes
(ii)	The proposed activity would not cause material damage to the hydrologic balance outside the permit area.	Yes	Yes	Yes
(iii)	The proposed activity would not result in conversion of the affected stream segment from perennial to ephemeral.	Yes	Yes	Not applicable
(iv)	The proposed activity would not result in conversion of the affected stream segment from intermittent to ephemeral or from perennial to intermittent.	Yes	Yes, except as provided in paragraphs (e)(2) and (5) of this section	Not applicable
(v)	There is no practicable alternative that would avoid mining through or diverting a perennial or intermittent stream.	Not applicable	Yes, except as provided in paragraph (e)(3) of this section	Yes
(vi)	After evaluating all potential upland locations in the vicinity of the proposed operation, including abandoned mine lands and unreclaimed bond forfeiture sites, there is no practicable alternative that would avoid placement of excess spoil or coal mine waste in a perennial or intermittent stream.	Not applicable	Not applicable	Yes

1		2	3	4
(vii)	The proposed operation has been designed to minimize the extent to which perennial or intermittent streams will be mined through, diverted, or covered by an excess spoil fill, a coal mine waste refuse pile, or a coal mine waste impounding structure.	Not applicable	Yes, except as provided in paragraphs (e)(3) and (5) of this section	Yes
(viii)	The stream restoration techniques in the proposed reclamation plan are adequate to ensure restoration or improvement of the form, hydrologic function (including flow regime), streamside vegetation, and ecological function of the stream after you have mined through it, as required by § 816.57 of this chapter.	Not applicable	Yes, except as provided in paragraph (e)(5) of this section	Not applicable
(ix)	The proposed operation has been designed to minimize the amount of excess spoil or coal mine waste that the proposed operation will generate.	§ 780.35(b) of this part requires minimization of excess spoil	§ 780.35(b) of this part requires minimization of excess spoil	Yes
(x)	To the extent possible using the best technology currently available, the proposed operation has been designed to minimize adverse impacts on fish, wildlife, and related environmental values.	Yes	Yes	Yes
(xi)	The fish and wildlife enhancement plan prepared under § 780.16 of this part includes measures that would fully and permanently offset any long-term adverse impacts on fish, wildlife, and related environmental values within the footprint of each excess spoil fill, coal mine waste refuse pile, and coal mine waste impounding structure.	Not applicable	Not applicable	Yes
(xii)	Each excess spoil fill, coal mine waste refuse pile, and coal mine waste impounding structure has been designed in a manner that will not result in the formation of toxic mine drainage.	Not applicable	Not applicable	Yes
(xiii)	The revegetation plan prepared under § 780.12(g) of this part requires reforestation of each completed excess spoil fill if the land is forested at the time of application or if the land would revert to forest under conditions of natural succession.	Not applicable	Not applicable	Yes

Alternative 8 (Preferred) would require the applicant to demonstrate that (1) the operation has been designed to minimize, to the extent possible, the volume of excess spoil that the operation would generate and (2) the designed maximum cumulative volume of all proposed excess spoil fills is no larger than the capacity needed to accommodate the anticipated cumulative volume of excess spoil that the operation would generate. Both requirements are intended to reduce the length of stream that the operation will cover.

In addition, this Alternative would prohibit construction of durable rock fills, which use end-dumping as a means of spoil placement and rely upon gravity segregation to form underdrains.

Under Alternative 8 (Preferred), the permittee must construct excess spoil fills in lifts not to exceed four feet in thickness. The use of end-dumping for final placement would be prohibited and the current regulation at 30 CFR 816.73 allowing construction of durable rock fills that rely upon end-dumping and the construction of underdrains by gravity segregation of the end-dumped material would be eliminated.

This Alternative would require daily monitoring during excess spoil placement. It would revise the existing rules to require that the quarterly inspection reports filed with the regulatory authority include the daily monitoring logs.

Alternative 8 (Preferred) would prohibit the construction of excess spoil fills with flat decks on the top surface. The final surface configuration must resemble the surrounding terrain. Alternative 8 (Preferred) would provide that, to the extent that stability considerations allow, excess spoil fills must be constructed with sufficient barriers (e.g. aquitards) to groundwater infiltration to ensure restoration of a stream's water quality and quantity and aquatic life after the completion of mining. Placement of a layer of lower-permeability spoil or other material near the surface but below the root zone for trees and shrubs could provide the subsurface flow needed to restore flow in intermittent and ephemeral stream segments.

2.4.8.2.3 Mining through Streams

As revised, Alternative 8 (Preferred) would allow mining through any type of stream (perennial, intermittent, or ephemeral) segment under the conditions described in the Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities) section for Alternative 8 (Preferred) above. The permittee must restore the form, hydrological function, and the ecological function of all perennial and intermittent streams that are mined through.

The regulatory authority must establish standards for determining when the ecological function of a restored or permanently diverted perennial or intermittent stream has been restored. In establishing these standards, the regulatory authority must coordinate with the appropriate agencies responsible for administering the Clean Water Act, 33 U.S.C. 1251 et seq., to ensure compliance with all Clean Water Act requirements. The biological component of the standards must employ the best technology currently available. For perennial streams, the best technology currently available includes an assessment of the biological condition of the stream, as determined by an index of biological condition or other scientifically defensible bioassessment protocols consistent with § 780.19(c)(6)(vii). Standards established for perennial streams need not require that a reconstructed stream or stream-channel diversion have precisely the same biological condition or biota as the stream segment did before mining, but they must prohibit substantial replacement of pollution-sensitive species with pollution-tolerant species. In

addition, they must require that populations of organisms used to determine the biological condition of the reconstructed stream or stream-channel diversion be self-sustaining within that stream segment.

Standards established for intermittent streams must meet the same requirements whenever a scientifically defensible biological index and bioassessment protocol have been established for assessment of intermittent streams in the state or region in which the stream is located. For all other intermittent streams, the best technology currently available consists of the establishment of standards that rely upon restoration of the form, hydrologic function, and water quality of the stream and reestablishment of streamside vegetation as a surrogate for the biological condition of the stream. The regulatory authority must reevaluate the best technology currently available for intermittent streams at five-year intervals. Upon conclusion of that evaluation, the regulatory authority must make any appropriate adjustments before processing permit applications submitted after the conclusion of that evaluation.

All standards must ensure that the reconstructed stream or stream-channel diversion will not—

(1) Preclude attainment of the designated uses of that stream segment under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), before mining, or, if there are no designated uses, the premining uses of that stream segment; or

(2) Result in that stream segment not meeting the applicable anti-degradation requirements under section 303(c) of the Clean Water Act, 33 U.S.C. 1313(c), as adopted by a state or authorized tribe or as promulgated in a federal rulemaking under the Clean Water Act.

The postmining drainage pattern of perennial, intermittent, and ephemeral stream channels must be similar to the premining drainage pattern, unless the regulatory authority: approves a different pattern to ensure stability; prevent or minimize downcutting of reconstructed stream channels; promote enhancement of fish and wildlife habitat; accommodate any anticipated temporary or permanent increase in surface runoff as a result of mining and reclamation; accommodate the construction of excess spoil fills, coal mine waste refuse piles, or coal mine waste impounding structures; replace a stream that was channelized or otherwise severely altered prior to submittal of the permit application with a more natural and ecologically sound drainage pattern or stream-channel configuration; or reclaim a previously mined area.

Designs for permanent stream-channel diversions, temporary stream-channel diversions that would remain in use for three or more years, and stream channels to be restored after the completion of mining must adhere to design techniques that would restore or approximate the premining characteristics of the original stream channel. These original characteristics would include the natural riparian vegetation and the natural hydrological characteristics of the original stream necessary to promote the recovery and enhancement of the aquatic habitat and to minimize adverse alteration of stream channels on and off the site, including channel deepening or enlargement. The designed hydraulic capacity of all temporary and permanent stream-channel diversions must be at least equal to the hydraulic capacity of the unmodified stream channel immediately upstream of the diversion and no greater than the hydraulic capacity of the unmodified stream channel immediately downstream from the diversion.

The permittee must establish a 100-foot-wide or wider streamside vegetative corridor on each side of every perennial, intermittent, and ephemeral stream that is mined through and reconstructed. The corridor

must be comprised of native species, including species with riparian characteristics when appropriate. Native trees and shrubs must be planted in areas that are forested at the time of permit application or that would revert to forest under conditions of natural succession. This revegetation requirement would not apply to prime farmland historically used for cropland or to situations in which revegetation would be incompatible with an approved postmining land use that is implemented during the revegetation responsibility period before final bond release.

2.4.8.3 AOC and AOC Variances

2.4.8.3.1 Surface Configuration

Same as Alternative 1, the No Action Alternative, with minor revisions to the definition of AOC to clarify its meaning, reflect state program amendment actions, and address implementation issues. Under the Preferred Alternative AOC means that surface configuration achieved by backfilling and grading of the mined area so that the reclaimed area closely resembles the general surface configuration of the land within the permit area prior to any mining activities or related disturbances and blends into and complements the drainage pattern of the surrounding terrain. All highwalls and spoil piles must be eliminated to meet the terms of the definition, but that requirement does not prohibit the approval of terracing, the retention of access roads or the approval of permanent water impoundments. For purposes of this definition, the term “mined area” does not include excess spoil fills and coal refuse piles.

Alternative 8 (Preferred) also requires that the postmining drainage pattern of perennial, intermittent, and ephemeral stream channels be similar to the premining drainage pattern, unless the regulatory authority approves a different pattern to ensure stability; prevent or minimize downcutting of reconstructed stream channels; promote enhancement of fish and wildlife habitat; accommodate any anticipated temporary or permanent increase in surface runoff as a result of mining and reclamation; accommodate the construction of excess spoil fills, coal mine waste refuse piles, or coal mine waste impounding structures; replace a stream that was channelized or otherwise severely altered prior to submittal of the permit application with a more natural and ecologically sound drainage pattern or stream-channel configuration; or reclaim a previously mined area.

2.4.8.3.2 AOC Variances

Alternative 8 (Preferred) would allow mountaintop removal mining operations and AOC variances for steep-slope mining operations under conditions generally similar to those in Alternative 1, the No Action Alternative. However, Alternative 8 (Preferred) would impose additional requirements to better protect streams, aquatic ecology, and biological communities. In addition, it would require that the permit include a condition prohibiting any bond release before substantial implementation of the approved postmining land use.

For approval of mountaintop removal mining operations, Alternative 8 (Preferred) would require the permit applicant to demonstrate that no damage would result to natural watercourses within the proposed permit and adjacent areas. The applicant can meet this requirement by making all of the following demonstrations:

- There would be no adverse changes in parameters of concern in discharges to surface water and groundwater;

- Flood hazards within the watershed containing the proposed permit area will be diminished by reduction of the size or frequency of peak-flow discharges from precipitation events or thaws.; and
- The total volume of flow during any season of the year would not vary; i.e., the seasonal flow regime would not change and there would be no increase in potential damage from flooding sufficient to adversely affect any designated use of surface water outside the proposed permit area under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), or, if there are no designated uses, any premining use of surface water outside the proposed permit area. Variations must also not adversely affect any premining use of groundwater outside the proposed permit area.
- The proposed operation would not result in any greater adverse impact to the aquatic and terrestrial ecology of the proposed permit and adjacent area than would occur if the area to be mined was restored to its approximate original contour.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application, unless reforestation would be inconsistent with the postmining land use.

Finally, the permittee must install drains through the outcrop barrier to prevent saturation of the backfill.

For approval of steep-slope variances, Alternative 8 (Preferred) would, in addition to the requirements in the existing rules, require permit applicants to demonstrate that all of the following criteria are met:

- The operation, including any fish and wildlife enhancement measures, will result in fewer adverse impacts to the aquatic ecology of the cumulative impact area than would occur if the site were mined and restored to AOC;
- The variance would not result in construction of an excess spoil fill in an intermittent or perennial stream; and
- Any deviations from the premining surface configuration are necessary and appropriate to achieve the postmining land use.

In addition, the permittee must reforest the site with native species if the site was forested before submission of the permit application or would revert to forest under natural succession. This requirement would not apply to permanent impoundments, roads, and other impervious surfaces to be retained following mining and reclamation or to those portions of the permit area covered by the variance.

2.4.8.4 Revegetation, Soils, Fish and Wildlife Protection and Enhancement

2.4.8.4.1 Revegetation, Reforestation and Topsoil Management

Alternative 8 (Preferred) includes provisions similar to those of the No Action Alternative with respect to soil management and revegetation, but with a greater emphasis on restoration of the site's ability to support the uses it supported before any mining, regardless of the approved postmining land use. Alternative 8 (Preferred) also places greater emphasis on construction of a growing medium with an adequate root zone for deep-rooted species and on revegetation with native tree and plant species, especially reforestation of previously forested areas.

Like the No Action Alternative, Alternative 8 (Preferred) requires salvage and redistribution of all topsoil (the A and E soil horizons). However, it also requires salvage and redistribution of the B and C soil horizons (or other suitable overburden materials) to the extent necessary to achieve a growing medium with the optimal rooting depths required to restore premining land use capability or comply with revegetation requirements. Under the No Action Alternative, the regulatory authority has the discretion, but not necessarily the obligation, to require salvage and redistribution of the B and C soil horizons or other suitable overburden materials.

Alternative 8 (Preferred) allows use of selected overburden materials as substitutes for (or supplements to) either topsoil or subsoil or both only if the applicant demonstrates that either (1) the quality of the existing topsoil and subsoil is inferior to that of other overburden materials or (2) the quantity of the existing topsoil and subsoil is insufficient to provide the optimal rooting depth or meet other plant growth requirements. In the latter case, all existing topsoil and favorable subsoil must be salvaged and redistributed together with the substitute material. As in the No Action Alternative, the applicant also must demonstrate that the resulting soil medium will be more suitable than the existing topsoil and subsoil to sustain vegetation and that the selected overburden materials are the best available within the permit area for that purpose. Alternative 8 (Preferred) differs slightly from the No Action Alternative in that the No Action Alternative allows the use of topsoil substitutes or supplements when the resulting soil medium will be equally or more suitable than the existing topsoil to sustain vegetation, while Alternative 2 allows their use only when the resulting soil medium will be more suitable to sustain vegetation.

Under Alternative 8 (Preferred), the permittee must salvage and redistribute all organic matter contained in or above the A soil horizon. This includes duff, other organic litter, and vegetative materials such as tree tops, small logs, and root balls. Salvaging these materials would increase the moisture retention capability of the soil and provide a source of the seeds, plant propagules, mycorrhizae, and other soil flora and fauna needed to support and enhance reestablishment of locally adapted and genetically diverse plant communities as well as to improve soil productivity. Burning vegetation or other organic materials would be prohibited.

The final version of Alternative 8 (Preferred) provides limited exceptions to the requirement for redistribution of salvaged organic material. Those exceptions apply to land used for row crops or intensive hay production and to land upon which structures, water impoundments, or other impermeable surfaces are sited as part of the postmining land use. The final version of Alternative 8 (Preferred) also requires that permit applications identify areas with substantial populations of invasive or noxious non-native species. The final version prohibits salvage and redistribution of organic materials from those areas. Instead, the operator must bury these materials at a depth sufficient to prevent regeneration.

Under Alternative 8 (Preferred) the permittee must reforest lands that were previously forested, or that would naturally revert to forest under conditions of natural succession, in a manner that would enhance recovery of the native forest ecosystem as expeditiously as possible. Prime farmland historically used for cropland is exempt from this requirement.

The permittee must revegetate the entire reclaimed area (other than water areas and impervious surfaces like roads and buildings) using native species to restore or reestablish the plant communities native to the area unless a conflicting postmining land use is actually implemented before the end of the revegetation responsibility period.

2.4.8.4.2 Fish and Wildlife Protection and Enhancement

Alternative 8 (Preferred) is similar to the No Action Alternative with respect to the protection of threatened and endangered species. At the DEIS stage, this Alternative would have included dispute resolution procedures in the regulations, codifying these procedures. In response to agency and public comment OSMRE has removed this from the final version of the Preferred Alternative.[24] However, Alternative 8 (Preferred) would make it a requirement that the applicant demonstrate to the regulatory authority that the proposal is in compliance with the Endangered Species Act of 11973, 16 U.S.C. 1531 et seq. through one of the following mechanisms:

(1) Providing documentation that the proposed surface coal mining and reclamation operations within or adjacent to the permit area would have no effect on species listed or proposed for listing as threatened or endangered under the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq., habitat occupied by those species, or on designated or proposed critical habitat, under that law; or

(2) Documenting compliance with a valid biological opinion that covers issuance of permits for surface coal mining operations and the conduct of those operations under the applicable regulatory program; or

(3) Providing documentation that interagency consultation under section 7 of the Endangered Species Act of 1973, 16 U.S.C. 1536, has been completed for the proposed operation; or

(4) Providing documentation that the proposed operation is covered under a permit issued pursuant to section 10 of the Endangered Species Act of 1973, 16 U.S.C. 1539.

Revised Alternative 8 (Preferred) requires that the applicant describe the steps that that applicant has taken or will take to comply with the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq., including any biological opinions developed under Section 7 of that law and any species-specific habitat conservation plans developed in accordance with Section 10 of that law. It also provides that the regulatory authority may not approve the permit application before there is a demonstration of compliance with the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq., through one of the mechanisms listed above.

Alternative 8 (Preferred) is similar to the No Action Alternative with respect to the fish and wildlife resource information and protection and enhancement plan required in the permit application. It also includes similar performance standards for protection of fish and wildlife. However, Alternative 8 (Preferred) requires that the permittee establish permanent streamside vegetative corridors at least 100 feet wide, comprised of native, non-invasive species, along the banks of restored or diverted ephemeral, intermittent or perennial stream channels. The permittee must use appropriate species of woody plants if

[24] OSMRE has undertaken formal Section 7 consultation with the U.S. FWS on the Preferred Alternative. The biological opinion, once issued, will be available on www.osmre.gov and on www.regulations.gov under the Stream Protection Rule docket. OSMRE is also coordinating with U.S. FWS to provide guidance to OSMRE, the U.S. FWS, and regulatory authorities for demonstrating compliance with the terms and conditions of the Incidental Take Statement that will accompany the biological opinion.

the land would naturally revert to forest under natural succession.

In addition, fish and wildlife enhancement measures would be mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant communities, or filling of a segment of a perennial or intermittent stream. The enhancement measures must be commensurate with the long-term adverse impact to the affected resources and they must be located in the same watershed as the proposed operation (or the nearest appropriate adjacent watershed if there are no opportunities for enhancement within the same watershed). Enhanced areas must be included within the permit area.

Finally, at the DEIS stage, the preferred Alternative 8 (Preferred) would have allowed the regulatory authority to prohibit mining of areas within the proposed permit area that are of such exceptional environmental value that any adverse mining-related impacts must be prohibited. In response to comments on the Proposed Rule, the final version of the Preferred Alternative does not include this authority. However, like the existing rules, this Alternative retains language intended to minimize adverse impacts to habitats of unusually high value to fish and wildlife.

2.4.9 Alternative 9 –2008 Stream Buffer Zone Rule

Alternative 9 is identical to the 2008 SBZ rule, which was vacated by court order on February 20, 2014. See 79 FR 76227-76233 (Dec. 22, 2014).

2.4.9.1 Protection of the Hydrologic Balance

2.4.9.1.1 Baseline Data Collection and Analysis

Same as Alternative 1, the No Action Alternative (see Baseline Data Collection and Analysis section for Alternative 1).

2.4.9.1.2 Monitoring During Mining and Reclamation

Same as Alternative 1, the No Action Alternative (see Monitoring During Mining and Reclamation section for Alternative 1).

2.4.9.1.3 Definition of Material Damage to the Hydrologic Balance Outside the Permit Area

Same as Alternative 1, the No Action Alternative (see Definition of Material Damage to the Hydrologic Balance Outside the Permit Area section for Alternative 1).

2.4.9.1.4 Evaluation Thresholds

Same as Alternative 1, the No Action Alternative (see Evaluation Thresholds section for Alternative 1).

2.4.9.2 Activities in or Near Streams

2.4.9.2.1 Stream Definitions

Same as Alternative 1, the No Action Alternative (see Stream Definitions section for Alternative 1).

2.4.9.2.2 Activities in or near Streams (Including Excess Spoil Fills and Coal Mine Waste Disposal Facilities)

The requirements in Alternative 9 differ depending upon whether the surface mining activities would occur in perennial or intermittent streams or whether they would be limited to the buffer zone for those streams (the surface of land within 100 feet, measured horizontally, of the stream). Under this Alternative, diversions of perennial and intermittent streams would be governed by a separate set of requirements. Also, as in Alternative 1, the No Action Alternative, coal preparation plants located outside the permit area of a mine would not be subject to these requirements.

Before approving any surface mining activities in a perennial or intermittent stream (other than a diversion of that stream), the regulatory authority must find in writing that avoiding disturbance of the stream is not reasonably possible. The permit also must include a condition requiring a demonstration of compliance with the Clean Water Act before the permittee may conduct any activities in a perennial or intermittent stream that require authorization or certification under the Clean Water Act.

Before approving any surface mining activities on the surface of land within 100 feet of a perennial or intermittent stream in situations where the activities would not take place in the stream segment itself, the SMCRA regulatory authority must find in writing that (1) avoiding disturbance of the surface of land within 100 feet of the stream either is not reasonably possible or is not necessary to meet the fish and wildlife and hydrologic balance protection requirements of the regulatory program and (2) that the measures proposed in the permit application constitute the best technology currently available to prevent the contribution of additional suspended solids to streamflow or runoff outside the permit area to the extent possible, and that the proposed measures would minimize disturbances and adverse impacts on fish, wildlife, and related environmental values to the extent possible There would be no requirement for the regulatory authority to make a separate finding approving activities such as disposal of excess spoil, coal mine waste, or construction of stream crossings or sediment ponds within the buffer zone for these stream segments.

However, the operation must be designed to avoid placement of excess spoil or coal mine waste in or within 100 feet of a perennial or intermittent stream to the extent possible. If avoidance is not reasonably possible, then the applicant must identify a reasonable range of alternatives and select the alternative with the least overall adverse impact on fish, wildlife, and related environmental values, including adverse impacts on water quality and aquatic and terrestrial ecosystems. However, an alternative with a cost substantially greater than the costs normally associated with this type of project need not be considered.

In addition, for excess spoil, the applicant must provide a demonstration that (1) the operation has been designed to minimize, to the extent possible, the volume of excess spoil that the operation would generate and (2) the designed maximum cumulative volume of all proposed excess spoil fills is no larger than the capacity needed to accommodate the anticipated cumulative volume of excess spoil that the operation would generate.

Excess spoil fill construction requirements are similar to those in Alternative 1, the No Action Alternative. Durable rock fills may be constructed by end-dumping and formation of underdrains by gravity segregation. Flat decks on the top surface of excess spoil fills are allowed. Inspections conducted at least quarterly and during critical stages of fill construction must be certified by a registered

professional engineer. The permittee must submit to the regulatory authority an inspection report after every inspection specifying that the fill has been constructed and maintained as approved.

2.4.9.2.3 Mining through Streams

Under Alternative 9, the regulatory authority may approve the diversion of perennial or intermittent streams within the permit area if the diversion is located and designed to minimize adverse impacts on fish, wildlife, and related environmental values to the extent possible, using the best technology currently available.

Design and construction requirements for a permanent stream-channel diversion or a stream channel restored after the completion of mining are similar to those in Alternative 1, the No Action Alternative. The exception is that Alternative 9 would require the use of natural-channel design techniques to minimize adverse alteration of stream channels on and off the site, including channel deepening or enlargement, to the extent possible.

2.4.9.3 AOC and AOC Variances

Same as Alternative 1, the No Action Alternative (see 2.4.1.3 – AOC and AOC Variances for Alternative 1).

2.4.9.3.1 Surface Configuration

Same as Alternative 1, the No Action Alternative.

2.4.9.3.2 AOC Variances

Same as Alternative 1, the No Action Alternative.

2.4.9.4 Revegetation, Soils, Fish and Wildlife Protection and Enhancement

Same as Alternative 1, the No Action Alternative (see Fish and Wildlife Protection and Enhancement section for Alternative 1).

2.4.9.4.1 Revegetation, Reforestation and Topsoil Management

Same as Alternative 1, the No Action Alternative.

2.4.9.4.2 Fish and Wildlife Protection and Enhancement

Same as Alternative 1, the No Action Alternative.

2.5 Alternative Comparison Discussion

The following comparisons of the nine Alternatives represent the major similarities and differences between each of the Alternatives.

2.5.1 Protection of the Hydrologic Balance Functional Group

2.5.1.1 Baseline Data Collection and Analysis

2.5.1.1.1 Biological Conditions

- The No Action Alternative (also Alternative 9) -- No requirement for baseline biological assessment;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Baseline biological conditions assessment required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.1.2 Hydrologic Conditions

2.5.1.2.1 Water Quality

- The No Action Alternative (also Alternative 9) -- Limited water-quality sampling points and analytical constituents. At a minimum, the analytical suite for surface water and groundwater consists of the following: temperature, total suspended solids (only surface water), pH, specific conductance, total dissolved solids (TDS), total iron, and total manganese;
- Alternative 2 (also 3, 4, 5, and 6) -- Baseline water-quality data are required on all intermittent and perennial streams and a representative number of ephemeral streams. Twelve evenly spaced samples are required from a consecutive 12-month period. The analytical suite for surface water and groundwater consists of the following: temperature, total suspended solids (only surface water), aluminum, bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, (hot) acidity, alkalinity, pH, selenium, specific conductance, TDS, total iron, arsenic, zinc, copper, cadmium, ammonia, nitrogen, and total manganese;
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – Requires detailed baseline water-quality data for intermittent and perennial streams. Twelve evenly spaced samples are required from a consecutive 12-month period, or with regulatory authority approval on a quarterly basis for 24 consecutive months. The analytical suite for surface water must include both total and dissolved fractions of the parameters. The parameters for both ground and surface water include the following, at a minimum: temperature, total suspended solids (only surface water), bicarbonate, sulfate, chloride, calcium, magnesium, sodium, potassium, (hot) acidity, alkalinity, pH, selenium, specific conductance, TDS, total (surface water only) and dissolved iron, total (surface water only) and dissolved manganese. Does not specifically require analysis of ammonia, arsenic, cadmium, copper, nitrogen, aluminum or zinc.

2.5.1.3 Surface Water Flow and Groundwater Levels

- The No Action Alternative (also Alternatives 3, 5, 8 (Preferred) and 9) -- Discrete stream flow and groundwater levels measurements required. Twelve evenly spaced samples required over a consecutive 12-month period;
- Alternative 2 (also 4 and 6) -- Continuous stream flow and groundwater levels measurements required; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.1.4 Rainfall Measurements

- The No Action Alternative (also Alternative 9) -- No onsite rainfall measurements required;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Continuous on-site[25] rainfall measurement requirements; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.1.5 Stream Hydrologic Form and Ecological Function

- The No Action Alternative (also Alternative 9) -- No documentation required of stream hydrologic form and ecological function;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) --Documentation of stream hydrologic form and ecological function required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.2 Monitoring During Mining and Reclamation

2.5.2.1 Biological Monitoring

- The No Action Alternative (also Alternative 9) -- No requirements for monitoring of biological condition;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) --Annual monitoring of biological condition required; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.2.2 Water-Quality Monitoring

- The No Action Alternative (also Alternative 9) -- Monitoring for limited suite of analytes [temperature, total suspended solids (only surface water), pH, specific conductance, TDS, total iron, and total manganese] and the regulatory authority can release operator from monitoring before bond release;
- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Quarterly monitoring until final bond release ; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.2.3 Rainfall Measurements

- The No Action Alternative (also Alternative 9) -- No requirement for on-site rainfall measurements;

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[25] In response to public comments the final version of Alternative 8 (Preferred) now allows for one single recording instrument to report precipitation data for multiple permits if the permits are close enough to each other.

- Alternative 2 (also 3, 4, 5, 6, and 8 (Preferred)) -- Continuous on-site rainfall measurements required; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.2.4 Runoff Control Structures

- The No Action Alternative (also Alternative 9) -- Certification of drainage control structures not required;
- Alternative 2 (also 6) -- Inspect and certify surface runoff control structures by a professional engineer after every one-year return interval precipitation event;
- Alternative 3 (also 4, 5 and 8 (Preferred)) -- Inspect and certify surface runoff control structures by a professional engineer after every two-year return interval precipitation event; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.2.5 Regulatory Authority Hydrologic Data Review

- The No Action Alternative (also Alternative 9) -- No regularly scheduled hydrologic review required;
- Alternative 2 (also 3, 4, 5, and 6) -- Regulatory authority review of monitoring data at permit mid-term review and permit renewal;
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative; and
- Alternative 8 (Preferred) – Regulatory authority review of monitoring data at 3-year intervals.

2.5.2.6 Definition of Material Damage to the Hydrologic Balance

- The No Action Alternative (also Alternatives 5, 6, 7 and 9) -- No national definition for material damage to the hydrologic balance. Regulatory authority discretion to determine material damage to the hydrologic balance criteria on case-by-case basis; and
- Alternative 2 (also 3, and 4) -- The term would be defined as any quantifiable adverse impact on the quality or quantity of surface water or groundwater or on the biological condition of intermittent and perennial streams that would preclude attainment or continuance of any designated surface-water use under sections 101(a) and 303(c) of the Clean Water Act or any existing or reasonably foreseeable use of surface water or groundwater outside the permit area. Includes areas overlying the underground workings of underground mines.
- Alternative 8 (Preferred) –Material damage to the hydrologic balance outside the permit area means an adverse impact, as determined in accordance with the rest of this definition, resulting from surface coal mining and reclamation operations, underground mining activities, or subsidence associated with underground mining activities, on the quality or quantity of surface water or groundwater, or on the biological condition of a perennial or intermittent stream. The determination of whether an adverse impact constitutes material damage to the hydrologic balance outside the permit area would be based on consideration of the baseline data and the following reasonably anticipated or actual effects of the operation:

(1) Effects that cause or contribute to a violation of applicable state or tribal water quality standards or a state or federal water quality standard established for a surface water outside the permit area under section 101(a) or 303(c) of the Clean Water Act, 33 U.S.C. 1251(a) or 1313(c), or, for a surface water for which no water quality standard has been established, effects that cause or contribute to non-attainment of any premining use of surface water outside the permit area.

(2) Effects that preclude a premining use of groundwater outside the permit area; or

(3) Effects that result in a violation of the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.

2.5.2.7 Evaluation Thresholds

- The No Action Alternative (also Alternatives 5, 6, and 9) -- No evaluation thresholds;
- Alternative 2 (also 3, and 4) -- Regulatory authority to develop evaluation thresholds that are less than the material damage to the hydrologic balance standards; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – Regulatory authority to develop evaluation thresholds for critical parameters in consultation with the Clean Water Act authority.

2.5.3 Activities In or Near Streams Functional Group

2.5.3.1 Stream Definitions

- The No Action Alternative (also Alternatives 3, 5, 6 and 9) -- No change in ephemeral, intermittent, and perennial stream definitions;
- Alternative 2 -- The definitions of intermittent, ephemeral, and perennial would be functionally replaced; all waterways defined as Waters of the U.S. under the CWA would be protected under this Alternative;
- Alternative 4 -- Streams defined based on flow and physical characteristics;
- Alternative 7 -- Existing definitions are not changed except that watershed size is not used as criteria to define intermittent streams; requires coordination with CWA authority; and
- Alternative 8 (Preferred) – Defines ephemeral, intermittent, and perennial streams in a way to limit the scope of those terms to conveyances with channels that have a bed-and-bank configuration and an ordinary high water mark, consistent with the approach taken by the USACE in implementing section 404 of the Clean Water Act. This change means that our rules will no longer classify a drainageway that has neither a bed-and bank configuration nor an ordinary high water mark as a stream. The existing rules classify all drainageways that do not qualify as perennial or intermittent streams as ephemeral streams. A stream with a bed that is always above the water table and with flows arising solely from snowmelt and precipitation events is ephemeral.

2.5.3.2 Activities in or near Streams, including Excess Spoil and Coal Refuse

- The No Action Alternative -- Prohibits mining activities through or within 100 feet of intermittent or perennial streams unless it can be demonstrated that the activity would not cause or contribute to the violation of applicable state or federal water quality standards and would not adversely affect the water quantity and quality or other environmental resources of the stream;
- Alternative 2 -- Prohibits surface mining activities in or within 100 feet of perennial streams. Prohibit surface mining activities in or within 100 feet of intermittent streams unless the applicant demonstrates that the activity would not: (1) preclude premining stream uses; (2) have more than a minimal adverse impact on the premining biological condition of the stream segment; or (3) cause material damage to the hydrologic balance outside the permit area. Requires a 100 foot forested streamside vegetative corridor for previously forested areas (or other native species for non-forested areas) adjacent to ephemeral or intermittent streams;
- Alternative 2 also prohibits placement of excess spoil within 100 feet of an intermittent stream (excess spoil placement is allowed in or near ephemeral streams). Under Alternative 2 disposal of coal mine waste in or within 100 feet of an intermittent or ephemeral stream is allowed;
- Alternative 3 (also 4 and 5) -- Prohibits surface mining activities in or within 100 feet of intermittent and perennial streams unless the applicant demonstrates that the activity would not: (1) preclude premining stream uses; (2) have more than a minimal adverse impact on the premining biological condition of the stream segment; or (3) cause material damage to the hydrologic balance outside the permit area;
- Alternative 6 --Prohibits mining activities within 100 feet of intermittent or perennial streams unless it can be demonstrated that: (1) the ecological function of the stream would be protected or restored; (2) placement of excess spoil fill or coal mine waste would not result in a discharge of "toxic mine drainage" and long-term adverse impacts to the environmental resources of the stream (within the footprint of the fill) would be offset in the same or adjacent watershed through fish and wildlife enhancement commensurate with the potential direct adverse impact to the stream; (3) other proposed mining activities within the stream buffer, but not within the stream itself would not adversely affect the water quantity and quality or other environmental resources of the stream; (4) a 100-foot streamside vegetative corridor would be required along the entire reach (including ephemeral streams) of any restored stream;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative;
- Alternative 8 (Preferred) – Prohibits mining activities within 100 feet of intermittent and perennial streams unless the applicant demonstrates that the proposed activity would meet the criteria listed previously in Table 2.4-2.
- Alternative 9 --Prohibits mining activities (other than construction of stream-channel diversions) within a perennial or intermittent stream unless the regulatory authority finds that avoiding disturbance of the stream is not reasonably possible.

Additionally,

- The No Action Alternative – Excess spoil minimization not expressly required by regulation;
- Alternative 2 (also 3, 4, 5, 6, 8 (Preferred) and 9) --The applicant must demonstrate that (1) the operation has been designed to minimize, to the extent possible, the volume of excess spoil that

the operation would generate and (2) the designed maximum cumulative volume of all proposed excess spoil fills would be no larger than the capacity needed to accommodate the anticipated cumulative volume of excess spoil that the operation would generate; and

- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- And also,
- The No Action Alternative (also 9) -- Durable rock fills may be constructed by end-dumping. Placement in streams is not expressly prohibited if all other applicable requirements are met;
- Alternative 2 (also 3, 4, 5, 6 and 8 (Preferred)) --The practice of "end-dumping" or creating a "durable rock fill" of fill material into streams is prohibited wherever a specific Alternative is applicable. In addition, daily monitoring and maintenance of daily log is required during fill construction; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.3.3 Mining Through Streams

- The No Action Alternative -- Allows diversion of intermittent and perennial streams upon regulatory authority finding that the diversion would not adversely affect the water quantity and quality and related environmental resources of the stream;
- Alternative 2 (also 4) -- No mining activities allowed in or within 100 feet of a perennial stream. Mining allowed through all intermittent streams upon demonstration by the applicant that the reclamation plan would achieve complete restoration of the hydrologic form and ecological function of all perennial and intermittent streams in accordance with standards established by CWA permitting authority and baseline conditions; additional performance bond required for stream restoration. All ephemeral streams must be restored in form;
- Alternative 3 (also 5, and 6) -- Mining allowed through all streams upon demonstration by the applicant that the reclamation plan would achieve complete restoration of the hydrologic form and ecological function of all perennial and intermittent streams in accordance with standards established by CWA permitting authority and baseline conditions; additional performance bond required for stream restoration. Ephemeral streams restored in form to the extent required by geomorphic reclamation;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative;
- Alternative 8 (Preferred) -- Requires restoration of both the hydrologic form and ecological function of intermittent and perennial streams that are mined through. Also requires establishment of postmining surface drainage pattern and stream-channel configuration that is similar to premining conditions, with certain exceptions;; and
- Alternative 9 -- Requires that restored stream channels for perennial and intermittent streams be designed and constructed using natural channel design techniques to restore or approximate the premining characteristics of the original stream channel.

2.5.4 AOC and AOC Variances Functional Group

2.5.4.1 AOC Variances

2.5.4.1.1 Mountaintop Removal Mining Operations

- The No Action Alternative (also 6, 7 and 9) – Achieve or support beneficial postmining land use; demonstrate equal or better land use. Assure investment in public facilities, and documentation of private financial capability to ensure completion. Requires demonstration that natural watercourses below lowest coal seam to be mined would not be damaged;
- Alternative 2 -- Prohibits all mountaintop removal mining operations (could require SMCRA amendment); and
- Alternative 3 (also 4, and 5) –Achieve or support beneficial postmining land use; demonstrate equal or better use. Requires implementation of the approved postmining land use prior to final bond release. Sufficient bond must be posted to ensure that, if the proposed postmining land use is not implemented, lands subject to the variance could be returned to approximate original contour. Requires assurance of investment in public facilities, and documentation of private financial capability to ensure completion. Requires demonstration that (1) no increase would occur in parameters of concern in discharges to surface or groundwater; (2) no change would occur in size or frequency of peak flow as compared to what would occur if the operator returned the site to approximate original contour; and (3) the total volume of flow during any season of the year would not vary (flooding potential cannot be altered). Requires demonstration that natural watercourses within the proposed permit and adjacent areas would not be damaged. If site was forested before permit application, then must return to forest and revegetate using native species except where inconsistent with the postmining land use.
- Alternative 8 (Preferred) – Same as Alternative 3 except that in the Preferred Alternative, the applicant is required to have substantially, and not fully, implemented the approved postmining land use prior to final bond release. And OSMRE has removed the proposed requirement that the applicant post a bond in amount sufficient to ensure that, if the proposed postmining land use is not implemented, lands subject to the variance could be returned to approximate original contour. All other demonstrations described above for Alternative 3 would still apply.

2.5.4.1.2 AOC Variances for Steep-Slope Operations

- The No Action Alternative (also Alternatives 6, 7 and 9) -- Achieve/support beneficial postmining land use; demonstrate equal or better land use. Demonstrate that surface water flow in the watershed would be improved over premining conditions ***or*** conditions what would have existed had the area been returned to AOC. Total suspended solids or pollutants to surface and ground water must be reduced in a manner that improves existing uses or ecology, ***or*** that reduces flood hazards due to reduced peak flow. Total flow volume in every season must not vary so as to adversely affect ecology of surface water or existing or planned use of surface or ground water;
- Alternative 2 -- Prohibits all variances from requirement to return the mined area to its AOC (could require SMCRA amendment); and
- Alternative 3 (also 4, and 5) -- Must demonstrate that surface water flow in the watershed would be improved over premining conditions ***and*** conditions that would have existed had the areas been returned to AOC. Must demonstrate that the AOC variance would result in fewer impacts to

aquatic ecology for the cumulative impact area than would occur if the site were returned to AOC. The AOC variance cannot result in any placement of excess spoil in an intermittent or perennial stream. The applicant must demonstrate that the proposed deviations from AOC are necessary and appropriate to achieve the postmining land use. The operator must post additional bond sufficient to ensure that, if the proposed postmining land use is not implemented, lands subject to the variance would be returned to AOC. If site was forested before permit application, then must return to forest and revegetate using native species except where inconsistent with the postmining land use.

- Alternative 8 (Preferred) – Same as Alternative 3 except that in the Preferred Alternative, OSMRE has removed the requirement for the operator to post additional bond sufficient to ensure that lands approved for a variance from AOC can be returned to AOC if the proposed postmining land use is not implemented.

2.5.5 Surface Configuration and Fills

2.5.5.1 Definition of AOC

- The No Action Alternative (also Alternatives 6, and 9) -- Definition of AOC would not change, includes backfilling and restoring disturbed areas to *closely resemble* premining topography;
- Alternative 2 (also 3, 4, and 5) -- Definition of AOC same as the No Action Alternative with the additional requirement that surface configuration achieved by backfilling and grading of the mined area be documented by landform measurements and analyses conducted before, during, and after mining and reclamation; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) –AOC means that surface configuration achieved by backfilling and grading of the mined area so that the reclaimed area closely resembles the general surface configuration of the land within the permit area prior to any mining activities or related disturbances and blends into and complements the drainage pattern of the surrounding terrain. All highwalls and spoil piles must be eliminated to meet the terms of the definition, but that requirement does not prohibit the approval of terracing, the retention of access roads or the approval of permanent water impoundments. For purposes of this definition, the term “mined area” does not include excess spoil fills and coal refuse piles.

2.5.5.2 Digital Terrain Analysis

- The No Action Alternative (also Alternatives 6, 8 (Preferred) and 9)-- Digital terrain analysis not required, requires mine plans to address postmining land use but introduces no new specific requirements for terrain analysis;
- Alternative 2 (also 3, 4, and 5)-- Requires use of digital terrain models during premining and backfilling to confirm premining topography, and adherence to the reclamation plan for backfilling except that remining sites and contiguous permits 40 acres or less are exempt; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.5.3 Permanent Impoundments and Final Elevations

- The No Action Alternative (also Alternative 3, 6, 8 (Preferred) and 9) -- No limits placed on final elevations. Still allows permanent impoundments, including final-cut impoundments provided they do not conflict with achieving AOC and they meet the postmining land use requirements. No requirements to use landforming principles during reclamation. ;
- Alternative 2 (also 4) -- Allowable deviation in the elevation of the backfilled and graded area postmining in comparison to the premining elevation based on the lowest coal seam mined. The allowable deviation in the postmining elevation could be no more than ±20 percent of the difference between the premining surface elevation and the premining bottom elevation of that lowest coal seam, with allowances for slope stability and minor shifts in the location of premining features. Allows exceedance of 20 percent tolerance to minimize excess spoil generation. In addition, tolerance requirement does not apply to that portion of the permit where steep-slope contour mining is conducted. Requires use of landforming principles (geomorphic reclamation). Still allows permanent impoundments, including final-cut impoundments provided they do not conflict with achieving AOC and they meet the postmining land use requirements;
- Alternative 5 – Same as the No Action Alternative except that it requires return of as much as spoil material to the mined area as possible (including transport of spoil above the original contour), and that it prohibits flat decks on excess spoil fills and coal refuse facilities; and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements (other than steep slope conditions) apply, otherwise same as the No Action Alternative. This Alternative does not require compliance with the ±20 percent tolerance because stability and equipment constraints make it impracticable to impose this requirement on contour mining on steep slopes (defined as slopes greater than 20 degrees).

2.5.6 Revegetation, Topsoil, and Fish and Wildlife Functional Group

2.5.6.1 Revegetation

- The No Action Alternative (also Alternatives 6 and 9) -- Vegetative cover in accordance with the approved permit and reclamation plan, comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use;
- Alternative 2 (also 3, 4, and 5) -- Requires that all reclaimed lands be revegetated with native species unless the postmining land use is actually implemented before the end of the revegetation responsibility period;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – Requires the use of native pollinator-friendly plants and planting arrangements that promote the establishment of pollinator-friendly habitat when practicable. The revegetation plan must create a diverse permanent vegetative cover that is consistent with native plant communities, and the species used must themselves be native with limited exceptions for temporary ground cover and certain postmining land uses.

2.5.6.2 Topsoil management

- The No Action Alternative (also Alternatives 6 and 9) -- Requires salvage and redistribution of all topsoil (A and E soil horizons) or the top 6 inches of soil material if less than that thickness of topsoil is present. Salvage and redistribution of the B and C soil horizons is at the discretion of the regulatory authority (except on prime farmland, where it is mandatory). Selected overburden materials may be substituted for, or used as a supplement to topsoil if the operator demonstrates to the regulatory authority that: (1) the resulting soil medium is equal to, or more suitable for sustaining vegetation than, the existing topsoil; and (2) the resulting soil medium is the best available in the permit area to support revegetation;
- Alternatives 2 (also 3, 4, 5 and 8 (Preferred)) -- Requires salvage and redistribution of all topsoil (A and E soil horizons). Also requires salvage and redistribution of the B and C soil horizons (or other suitable overburden materials) to the extent necessary to achieve a growing medium with the optimal rooting depths required to restore premining land use capability or comply with revegetation requirements. Allows use of selected overburden materials as substitutes for (or supplements to) either topsoil or subsoil or both if the operator demonstrates that either (1) the quality of the existing topsoil and subsoil is inferior to that of other overburden materials or (2) the quantity of the existing topsoil and subsoil is insufficient to provide the optimal rooting depth or meet other plant growth requirements. In the latter case, all existing topsoil and favorable subsoil must be salvaged and redistributed. The operator also must demonstrate that the resulting soil medium would be more suitable than the existing topsoil and subsoil to sustain vegetation and that the selected overburden materials are the best available within the permit area for that purpose. The operator would have to redistribute soils in a manner that limits compaction, and provides optimal rooting depth to support the approved plan for revegetation and reforestation; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.6.3 Salvage and Redistribution of Organic Materials

- The No Action Alternative (also Alternatives 6 and 9) -- Does not require salvage and redistribution or reuse of organic materials (duff, other organic litter, and vegetative materials such as tree tops, small logs and root balls) above the A soil horizon;
- Alternative 2 (also 4) -- Requires salvage and redistribution or reuse of ***all*** vegetative organic materials above the A soil horizon to promote reestablishment of locally adapted and genetically diverse native vegetation and soil flora and fauna and to enhance fish and wildlife habitats. Prohibits burning or burying of vegetation or other organic materials;
- Alternatives 3 (also 5) -- Requires salvage and redistribution of materials from native vegetation only (not from all vegetation) above the A soil horizon in accordance with an approved plan developed by a qualified ecologist or similar expert who would determine the amounts needed to promote reestablishment of native vegetation and soil flora and fauna. Prohibits burning of above-ground debris from native vegetation. Organic materials not needed for the approved plan may be used to construct fish and wildlife enhancement features;
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative; and

- Alternative 8 (Preferred) – Same as Alternative 3 except that it creates a limited exception to the requirement for salvage and redistribution or other use of organic matter. The Preferred Alternative also requires that organic matter from invasive species be buried rather than salvaged and redistributed.

2.5.6.4 Reforestation

- The No Action Alternative (also Alternatives 6 and 9) -- Lands that have returned to forest through natural succession classified as "undeveloped" are not required to be reforested;
- Alternative 2 (also 3, 4, 5 and 8 (Preferred)) -- Requires reforestation of previously forested areas and of lands that would revert to forest under conditions of natural succession (except for prime farmland historically used for cropland) in a manner that would enhance recovery of the native forest ecosystem as expeditiously as possible; and
- Alternative 7 -- Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.6.5 Fish and Wildlife Protection and Enhancement

2.5.6.5.1 Enhancement of Fish and Wildlife

- The No Action Alternative (also Alternative 9) -- Achieve enhancement of fish and wildlife resources where practicable. Surface mining activities must enhance where practicable, or restore, habitats of unusually high value for fish and wildlife;
- Alternative 2--Enhancement required if mitigation required pursuant to the CWA. CWA mitigation incorporated as a condition of the SMCRA permit. Bond release on the SMCRA permit would be conditioned on successful mitigation as determined by the regulatory authority and the agency implementing the CWA. This option may require an amendment of SMCRA;
- Alternative 3 (also 4, 5, and 6) -- Enhancement measures would be mandatory whenever the proposed operation would result in the long-term loss of native forest, loss of other native plant communities, or filling of a segment of a perennial or intermittent stream (but not ephemeral streams). Resource enhancement must be: (1) commensurate with long-term adverse impact to affected resources; and (2) be located in the same or nearest adjacent watershed as the proposed operation if there are no opportunities for enhancement within the same watershed, and be on permitted area. Mining of certain areas within the permit area with exceptional environmental value may be prohibited by regulatory authority;
- Alternative 8 (Preferred) --Same as Alternative 3 except that it does not include provision for prohibiting mining on areas of exceptional environmental value within the permit area; and
- Alternative 7 – Same as Alternative 3 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.5.6.5.2 Endangered and Threatened Species Protection

- The No Action Alternative (also Alternatives 6 and 9) -- No surface mining activity can be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary or which is likely to result in the destruction or adverse modification of designated critical habitat of such species in violation of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.)*;
- Alternative 2 (also 3, 4, and 5) -- Same as Alternatives 1 and 6, in addition would (1) codify the dispute resolution provisions of the biological opinion concerning protection of threatened and endangered species and (2) add a provision to the regulations expressly requiring that the fish and wildlife protection and enhancement plan in the permit application include any species-specific protection and enhancement plans developed in accordance with the Endangered Species Act and any biological opinions implementing that law; and
- Alternative 7 – Same as Alternative 2 where enhanced permitting conditions apply, otherwise same as the No Action Alternative.
- Alternative 8 (Preferred) – The "adjacent area" includes those areas outside the proposed or actual permit area where surface coal mining operations or underground mining activities may affect a species listed or proposed for listing as endangered or threatened under that Act or designated or proposed critical habitat under that Act. Requires that the applicant document that the proposed operation would have no effect on species listed or proposed for listing as threatened or endangered or on designated or proposed critical habitat; or documentation of consultation on impacts and planned compliance with terms and conditions resulting from consultation. Does not codify the dispute resolution procedures but instead addresses them through the SPR biological opinion and the ESA MOU.

2.5.6.5.3 Streamside vegetative corridors

- The No Action Alternative (also Alternative 9) -- The operator must avoid disturbances to, enhance where practicable, restore, or replace, wetlands, and riparian vegetation along rivers and streams and bordering ponds and lakes;
- Alternative 2 (also 5, 6 and 8 (Preferred)) -- Requires creation of a 100-foot streamside vegetative corridor, comprised of native non-invasive species, to enhance restoration of the ecological function of ephemeral, intermittent, or perennial streams that are mined through. The streamside vegetative corridor must be established along the entire reach of any stream restored or permanently diverted;
- Alternative 3 (also 4) -- Requires establishment of a 300-foot streamside vegetative corridor comprised of native woody species along restored or permanently diverted intermittent and perennial streams, if the land would naturally revert to forest under natural succession (not required if this would conflict with the approved postmining land use); and
- Alternative 7 – Same as Alternative 2 when enhanced permitting requirements apply, otherwise same as the No Action Alternative.

2.6 Alternatives And Elements Considered But Dismissed

The discussion below summarizes Alternatives and elements that OSMRE considered but did not ultimately carry forward for analysis. As part of the development of this DEIS, OSMRE used a mine plan analysis of 13 model mines representative of all seven coal-producing regions to model the effects of the Alternatives and elements, and based on this analysis determined that the following Alternatives were not reasonable to carry forward. The text below describes the findings on two Alternatives that OSMRE considered but ultimately dismissed from further analysis. The text also describes an element that OSMRE considered including within the Alternatives. OSMRE modified this element from its original form and included it within the Alternatives carried forward; this section describes the reasons behind the modification.

2.6.1 Alternative - Absolutely prohibit all surface coal mining and reclamation activities, including fill placement and coal mine waste, in or within 100 feet of all streams, including ephemeral.

OSMRE preliminarily analyzed, but chose not to carry through, an Alternative that would prohibit all mining and reclamation activities within all streams (ephemeral, intermittent and perennial) and within a 100-foot buffer zone around those streams. The prohibited activities would include the disposal of excess spoil and coal mine waste as well mining through the stream.

According to the model mine analysis, implementation of this Alternative would significantly reduce production nationwide. In 2010, U.S. Energy Information Administration data showed that surface mining methods produced almost 69 percent of coal production in the United States. Table 2.6-1 shows, using modeled surface mines, the impact on coal resource recovery from surface mines under this Alternative. The analysis indicated that this Alternative would result in a net loss of access to 86 percent of mineable surface coal reserves (based on tonnage) in five regions.

The prohibition against mining activities within the buffer would leave large quantities of coal stranded, i.e. un-mineable. Coal within the buffer would not be accessible for mining, and the mining would leave some coal stranded in inaccessible pockets between intersecting buffer zones.

High stream densities would strand additional coal in other areas. Providing buffers around all streams in areas with high stream densities would create a situation where the remaining suitable area for mining would be too small to support an economic return. This is the case, for example, in extensive areas of the Colorado Plateau, Illinois Basin and Gulf Coast mining areas. In other areas the modeling showed that mineable area would still occur but the buffer would significantly reduce both mineable area and coal production. In the Northern Rocky Mountains and Great Plains regions, prohibition of mining activities in the buffer zone would leave only about 12 percent of the mineable reserves available for mining.

Table 2.6-1.
Comparison of Recoverable Coal Resources for the No Action Alternative and Alternative Prohibiting Mine Activity In or Within 100 Feet of all Streams

	Tons of Surface Mineable Coal (millions)[1]	Tons of Surface Mineable Coal (millions)[1]	Mineable Acreage	Mineable Acreage	Millions of Tons of Reserves Stranded	Percent Reserves Stranded (based on tons of mineable coal)
Coal Region	**No Action Alternative**	**Alternative w/ No Activity in Stream**	**No Action Alternative**	**Alternative w/ No Activity in Stream**	**Alternative w/ No Activity in Stream**	**Alternative w/ No Activity in Stream**
Central Appalachia (Area)	37	**19**	1260	**758**	**18**	**49%**
Central Appalachia (Contour)	5	**4.4**	458	**324**	**0.6**	**12%**
Northern Appalachia	1.6	**1.6**	205	**201**	**0**	**0%**
Colorado Plateau	92.2	**0**	3311	**3,311**	**92.2**	**100%**
Gulf Coast	40.7	**17**	1988	**804**	**23.7**	**58%**
Illinois Basin	12	**0**	1067	**1,067**	**12**	**100%**
Northern Rocky Mountains and Great Plains	1,000	**123**	6049	**710**	**877**	**88%**
U.S. Total	1,188.5	**165**	14,338	**7,175**	**1,023.5**	

[1]Assumes off-site excess spoil disposal is available if needed.

The analysis of impacts from this Alternative assumed that adequate disposal for excess spoil and coal waste material would be available and economically obtainable off-site. Without this assumption, the prohibition against disposal of excess spoil in or within 100 feet of streams would have created additional impacts on coal production. Coal outside the buffer would be un-mineable in situations where the site topography left insufficient space for placement of spoil other than within the buffer zone. For example, due to the topography of Central Appalachia the availability of area not within 100 feet of either side of a stream is extremely limited and would likely be insufficient to accept the amount of materials produced from mining outside the buffer.

The potential impact to underground mining operations in regions with steeper topography or higher stream densities from a prohibition on coal mine waste disposal in streams was not analyzed but would be considerable. Since disposal facilities typically place coal waste in stream buffer zones, in particular the fine coal waste disposed in slurry impoundments, the expected consequence would be a reduction in underground coal production in these regions.

The results of the preliminary analysis indicated that implementation of this Alternative would result in a significant reduction in coal recovery in five of the seven coal-producing regions. OSMRE determined that the impacts to coal production from this Alternative were so substantial that they ran counter to the mandate under SMCRA 102(f) to balance the need for energy with the protection of the environment. While the prohibition would provide maximum protection for streams, it would result in an unacceptable impact on the nation's energy production via coal. For this reason, OSMRE determined that this

Alternative did not fall within the range of reasonable Alternatives, and dismissed this Alternative from further consideration.

2.6.2 Alternative - Prohibit further mining activities in watersheds with 10 percent or more land area impacted by coal mining.

Under this Alternative, the ability to obtain a mining permit would be dependent on the extent of current and past mining within the watershed encompassing the proposed permit area. The regulatory authority would no longer issue permits for surface coal mining activities once 10 percent or more of the acreage within a Hydrologic Unit Code (HUC)-12[26] watershed had been impacted by coal mining either historic or ongoing (acreage on successfully reclaimed sites would also count). No exemptions would apply. OSMRE selected the 10 percent threshold based on a recent study that showed that biodiversity and water quality declined in West Virginia and adjacent states when coal mining related impacts to watersheds exceeded 10 percent by area (Palmer and Bernhardt, undated). The rationale for the selection of 10 percent was that this threshold might represent a point after which cumulative impacts would result in material damage to the hydrologic balance outside the permit area. Definition of actual thresholds for specific watersheds may require additional research; the actual threshold for material damage to the hydrologic balance in any particular watershed may in fact be higher or lower depending on a number of parameters. The 10 percent threshold selection allows for a preliminary discussion only.

To analyze the effect this Alternative would have on coal production OSMRE selected two areas of the country with the highest coal production in 2010, the Powder River Basin and three counties in Southern West Virginia. OSMRE utilized U.S. Geological Service (USGS) hydrographic data to map HUC-12 watershed boundaries in comparison to existing coal mine permit boundaries in the study areas. OSMRE then used the overlap of coal mine impacts to the watershed boundaries to allow the selection of those watersheds with greater than 10 percent of their acreage affected by mining.

The results showed that 15 of the 29 HUC-12 watersheds that contain coal resources in the Powder River Basin had greater than 10 percent of their acreage impacted by coal mining. This Alternative would therefore prohibit future mining in over 50 percent of the Powder River Basin watersheds. OSMRE used new and pending applications, as of 2011, for mining in the Powder River Basin to provide a basis for examining the effect the prohibition would have on the approval of future permits with the assumption that these 2011 applications were indicative of where future mining interest would focus.

OSMRE conducted a similar analysis of selected watersheds in southern West Virginia. OSMRE obtained data for watersheds encompassing Mingo, Logan, and Boone counties. These three counties combined produced 50 percent of West Virginia's coal in 2010. In that year, West Virginia produced 93 million tons of coal, which made up about nine percent of total U.S. production.

OSMRE overlaid USGS HUC-12 watershed boundary data over the boundaries of all mining activity (current and reclaimed, but excluding abandoned mine lands) within these counties. The analysis included impacts associated with underground mines also, but only the extent of surface disturbance

[26] A HUC-12 watershed map defines watershed boundaries at the sixth level of subdivision (the subwatershed) using a 12 digit code.

associated with the underground mine. The results of the analysis show that coal mining had affected less than 10 percent of the available acreage in only 18 of the 46 watersheds within these three counties. Therefore, if OSMRE implemented this Alternative future mining would be prohibited in 28 of 46 (over 60 percent) of the watersheds in these three counties. Additionally five of the 46 watersheds had coal mining impacts on over nine percent of their acreage; therefore limited acreage would remain before the prohibition would apply to these watersheds as well.

As described above, the analysis shows that this Alternative would significantly affect the ability to mine coal in three of the highest coal-producing counties in West Virginia and over half of currently mined watersheds in the Powder River Basin. It would greatly restrict the ability to mine coal in areas of the country that produce a sizeable percentage of the nation's coal. Additionally, this Alternative would impose these impacts on coal production based on an acreage threshold that has not been scientifically determined to be a suitable nationwide basis for determining the likelihood or extent of material damage to the hydrologic balance. For these reasons, OSMRE determined that this Alternative was not scientifically justifiable, and did not meet the purpose of the proposed action.

2.6.3 Element to include in an Alternative - Restrict final elevations for backfilled and graded areas reclaimed after mining to a maximum ± 10 percent of the difference between the premining surface elevation and the bottom elevation of the lowest coal seam mined.

Each Alternative consists of several elements as described in the previous section of this Chapter. In developing the Alternatives OSMRE considered an element that would restrict final elevations for backfilled and graded areas reclaimed after mining to a maximum ± 10 percent of the difference between the premining surface elevation and the bottom elevation of the lowest coal seam mined. The tolerance would not apply to steep slope permits because these permits would require the operator to minimize disposal of excess spoil and instead to maximize placement of spoil material on the mined area. This Alternative would also have allowed minor shifts in the location of premining features and landforms to accommodate certain mining techniques.

The initial analysis showed that the ±10 percent threshold would not be achievable in some western areas where the overburden is so thin in comparison to the thickness of the mined coal seam that it would not be possible to return the final elevation within the mandated tolerance without bringing in additional material to fill the excavated hole. The tolerance threshold would also not apply for most Central Appalachian surface mines, where the predominance of steep slopes would result in most operations being exempt.

The mining ratios presented in Table 2.6-2 are indicative of the ability for mining operations to comply with the proposed tolerance requirements. The mining ratio presented here is the ratio of spoil material (in cubic yards) produced for every ton of coal mined. The higher the ratio, the greater the amount of excess spoil which the operator must return either to the site or place offsite. Where the ratio is above 7.3 cubic yards of spoil per ton of coal mined the amount of excess spoil would produce a final elevation above the 10 percent maximum elevation change. Where the ratio is below 2.6 cubic yards of spoil per ton of coal mined the amount of spoil would be insufficient to replace the volume lost due to the removal of the coal volume. These ratios rely on the assumption that the overburden would swell in volume by 25

percent due to handling, which would create additional spaces between overburden particles when they are placed back versus their arrangement before the mining disturbance.

Table 2.6-2.
Mining Ratios for Model Surface Mines

Coal Region	Ratio of spoil (volume) to coal mined (weight)[1]
Central Appalachia (Area)	16.1
Central Appalachia (Contour)	13.2
Northern Appalachia	12.7
Colorado Plateau	9.8
Gulf Coast	10.3
Illinois Basin	15.5
Northern Rocky Mountains and Great Plains	1.5

[1]All figures represent cubic yards of spoil per ton of coal mined.

As shown in the Table 2.6-2, the modeled ratios for spoil to coal are outside the target range (2.6 to 7.3 cubic yards of spoil per ton of coal mined) in all of the regions. Therefore all but one region would have excess spoil and the remaining region (the Northern Rocky Mountains and Great Plains region) would have insufficient spoil. OSMRE therefore rejected the ±10 percent elevation threshold requirement, and instead incorporated a ±20 percent elevation threshold into Alternatives 2, 4 and 7. These Alternatives, including the revised threshold requirement, are carried forward for analysis in this FEIS.

Protecting Bureaucracy, Not Streams

STREAM PROTECTION RULE

The Office of Surface Mining and Reclamation Enforcement's (OSMRE) proposed Stream Protection rule (SPR) provides no discernable environmental benefits while duplicating extensive existing environmental protections—something that is expressly prohibited under the Surface Mining Control and Reclamation Act (SMCRA).

2,200-page rule that is a win for bureaucracy and extreme anti-mining groups, and a loss for everyday Americans.

The Rule:

- **Disregards state authority and expertise.** States were shut out of the rulemaking development process. Eight out of 10 states that originally signed on as state cooperating agencies have withdrawn from their agreements after a four-year period without any dialogue because of OSMRE's lack of cooperation despite its legal obligation to do so.
  - Nineteen states have written letters to OSMRE urging the agency to comply with congressional mandates and reengage with the states.
- **Duplicates, contradicts and creates confusion around established state and federal regulations.** Extensive environmental protections are currently administered by the Environmental Protection Agency, the Army Corps of Engineers, the Fish and Wildlife Service and the states' regulatory authorities. SMCRA expressly prohibits rulemaking that creates regulatory overlap resulting in uncertainty through inconsistent requirements.
- **Harms U.S. jobs.** A technical analysis of the impact of the proposed rule shows that up to 78,000 coal mining jobs are now at risk. When coal-supported jobs in manufacturing, power plants and freight rail are included, the toll on employment rises to between 113,000 and 280,000. Estimated job losses are based upon an independent analysis performed at 36 operating surface and underground mines across the country. By contrast, OSMRE's analysis of economic impacts relied upon "hypothetical mines."
- **Blocks access to important American resources.** Under the rule, one half or more of total U.S. coal reserves could be off limits to mining—a result at direct odds with SMCRA, which finds that the regulatory policies should encourage surface and underground mining.
- **Devastates much-needed tax revenues in coal communities and states.** Coal mining contributes more than $18.5 billion annually in state and federal tax revenues. Those revenues are expected to be reduced by between 15 and 35 percent as a result of the rule, devastating communities that have already been hit hard by job losses and reduced mining activity.

Costs	Benefits
⊖ Conflicts with the agency's authority, Clean Water Act and the Endangered Species Act existing regulatory authorities	⊕ Job security for federal government employees wading into areas already regulated by the states and other agencies.
⊖ 113,000 – 280,000 American jobs lost	⊕ A win for extreme anti-mining groups looking to lock natural resources in the ground, at any cost.
⊖ 15-35 percent reduction in state and federal tax revenues	

Stream Protection Rule Fact Sheet

The final Stream Protection Rule (SPR) updates rules that are over 30 years old in order to more completely implement the law, the Surface Mining Control and Reclamation Act, to better protect the health and safety of people and the environment from the adverse effects of surface and underground coal mining.

The final SPR will protect or restore about 6,000 miles of streams and 52,000 acres of forest over two decades. Key elements include:

- Prevents water pollution outside the permit area.
- Requires comprehensive premining data collection and monitoring provisions for the proposed mining operation and adjacent areas.
- Requires protection or restoration of streams and related resources.
- Authorizes approval of mountaintop removal mining operations only when natural watercourses will not be destroyed.
- Requires implementation of fish and wildlife enhancement measures commensurate with any long-term adverse environmental impacts.
- Ensures that premining land use capabilities are restored.
- Updates measures to protect threatened and endangered species.
- Requires guaranteed treatment of unanticipated water pollution discharges that require long-term treatment.

The final SPR economic impacts are small relative to the size of the coal industry:

- Employment will increase an average of 156 full time jobs.
- Coal production may decline by an average annual 0.08% from baseline, accompanied by an approximately 1% increase in average annual coal prices.
- Total industry compliance costs per year would average slightly more than $80 million, which is 0.3% or less of $31.2 Billion *estimated 2015 coal revenues*.
- Impact on a household's monthly electric bill is negligible. Average wholesale electricity prices are expected to increase by approximately 0.02%, which means a household using 900 kw paying $113/ month would pay 20 cents more per month.

Endangered Species Act (ESA) Section 7 Consultation: OSMRE completed consultation under the ESA with the US Fish & Wildlife Service, resulting in a new 2016 Biological Opinion that supersedes the 1996 Biological Opinion for the existing regulatory program. The new 2016 Biological Opinion provides clear, expeditious ESA compliance and incidental take protection for industry and state regulators but will not provide protection to them if the SPR is not implemented.

Stream Protection Rule
Myths v. Facts

1. Myth: The SPR will result in the loss of between 40,000 and 77,500 jobs in the coal industry.

   Fact: The final SPR will not have an adverse impact on jobs. The regulatory impact analysis (RIA) for the rule estimates overall that employment will increase an average of 156 full time jobs. Where coal production is unprofitable under market conditions, jobs are predicted to decline by an average annual aggregate of 124 fulltime jobs. This will be more than offset by an average annual gain of 280 fulltime jobs needed to comply with the rule where mining remains profitable, such as additional jobs like heavy machine operators for materials placement and water sampling professionals. For purposes of comparison, the Energy Information Administration reports that total coal industry employment in 2015 was equal to 65,971, decreasing 12% from 2014.

2. Myth: The SPR will prohibit longwall mining and place up to 64% of total U.S. coal reserves off-limits to mining.

   Fact: The final SPR will not have a significant adverse impact on longwall mining, mineable reserves or coal production. The final rule does not prohibit the use of longwall mining or other underground mining methods that use planned subsidence, provided that those operations would not cause material damage to the hydrologic balance outside the permit area. Rather, the engineering analysis in the RIA finds that most remaining coal reserves suitable for longwall mining are so deep that subsidence from longwall mining is unlikely to have a substantial adverse impact on streams. Temporary impacts are allowed so long as they do not rise to the level of material damage to the hydrologic balance outside the permit area. Diminished flow within a short section of a stream segment over a longwall panel that recovers within a brief period of time or is repairable may have no discernible impact on attainment of water quality standards or premining uses and would not constitute material damage to the hydrologic balance outside the permit area.

3. Myth: The SPR duplicates and conflicts with state agency authority under the Clean Water Act.

   Fact: The final SPR was revised in response to comments, particularly those provisions relating to the Clean Water Act (CWA), to promote coordination and consultation between

SMCRA and CWA program agencies while clarifying and preserving each agency's decision-making authority under pertinent law. Both the Environmental Protection Agency (EPA) and the US Army Corps of Engineers (ACOE) concurred with the final rule. The concurrence letter from EPA states that "we have concluded that nothing in the Stream Protection Rule is inconsistent with the provisions of the CWA [Clean Water Act] and that the final rule does not inhibit the EPA's CWA authority to require that surface mining activities comply with all applicable provisions of the CWA, particularly those provisions related to water quality." The EPA concurrence letter further states that "the final Stream Protection Rule incorporates measures to limit duplication and avoid inconsistency in the implementation of SMCRA and CWA programs, while supporting complementary, comprehensive, and effective environmental reviews of proposed surface coal mining operations."

4. Myth: OSMRE did not coordinate with state regulatory authorities or comply with Congressional direction to do so.

   Fact: As discussed in a letter dated December 15, 2016, from Secretary Sally Jewell to Paul Ryan, Speaker of the House of Representatives, OSMRE has provided extensive opportunity for state involvement. OSMRE shared an early administrative draft of the environmental impact statement (EIS) with state regulatory authorities and utilized the comments received to revise the draft EIS. Additionally, over 100 days were provided for comment on the proposed SPR, draft EIS, and draft RIA. OSMRE also held public hearings in six cities across the country to allow stakeholders an opportunity to provide feedback on the proposed rule and associated documents. During the public comment period, we received more than 94,000 comments on the proposed rule and associated documents.

   OSMRE also engaged extensively with state regulatory authorities both prior to and consistent with the direction in the report accompanying the Consolidated Appropriations Act of 2016. These efforts included the OSMRE Director's letters to at least 15 states offering to discuss the proposed rule. In addition, the Assistant Secretary of the Interior for Land and Minerals Management, and OSMRE senior leadership traveled across the country to meet with numerous representatives of state regulatory authorities concerning the rule, as well as members of the Interstate Mining Compact Commission, and received valuable feedback that was incorporated into the final rule. OSMRE also hosted technical assistance meetings and teleconferences across the country to provide states with more opportunities to ask questions in person and by telephone. Since September 2015, Interior Department and OSMRE officials and staff held 24 meetings, including in-person meetings and teleconferences, with state representatives regarding the SPR.

These meetings were not the only opportunities during which states, industry, and other interested parties have had an opportunity to discuss the proposed rule. Specifically, the Office of Management and Budget's Office of Information and Regulatory Affairs (OIRA) held 38 meetings and teleconferences with representatives of state regulatory agencies, industry, and stakeholder groups, as well as representatives of the Congressional Coal Caucus, to discuss the proposed rule. A Departmental representative participated in a large majority of these meetings and teleconferences.

The Assistant Secretary and Director attended the July 12, 2016, OIRA-hosted meeting with the Congressional Coal Caucus at which five Congressional Coal Caucus members participated, in addition to staff from an additional eight members' offices and staff from the House Natural Resources Committee. Other OIRA-hosted meetings included representatives from state regulatory authorities in Alaska, Illinois, Indiana, Kentucky, North Dakota, Ohio, Virginia, and Wyoming, as well as a number of state coal associations.

Consistent with the guidance provided by Congress in the report accompanying the Consolidated Appropriations Act of 2016, OSMRE used modern, transparent, and cost-effective means to provide states access to SPR documents through regulations.gov. OSMRE also provided the states with a list of over 670 reference documents that were used during the development of the proposed rule. State agencies, including the Wyoming Department of Environmental Quality, have been provided additional opportunities for input.

5. Myth: The SPR does not accord sufficient deference to principles of state primacy.

   Fact: The SPR continues to recognize state primacy in the regulation of surface coal mining and reclamation operations, as provided in section 101(f) of SMCRA. Primacy states can and should tailor their SMCRA regulatory programs to local conditions, provided that those programs meet the minimum requirements of SMCRA and are no less effective than the federal regulations, as revised by the SPR.

   OSMRE has authority under sections 201(c)(2) and 501(b) of SMCRA to issue regulations like the SPR to establish minimum federal standards for the regulation of surface coal mining and reclamation operations. In particular, section 201(c)(2) of SMCRA provides that the Secretary, acting through OSMRE, shall "publish and promulgate such rules and regulations as may be necessary to carry out the purposes and provisions of this Act[.]" The SPR updates the federal minimum standards, which were originally adopted decades ago, to reflect 30 years of scientific research on mining and reclamation techniques and its environmental impacts and 30 years of experience in implementing SMCRA.

6. Myth: The SPR provides the U.S. Fish and Wildlife Service (FWS) with a veto over issuance of state permits under SMCRA.

   Fact: Under section 7 of the Endangered Species Act (ESA), OSMRE must consult with the U.S. Fish and Wildlife Service (Service) on any action that "may affect" listed terrestrial and freshwater species, including implementation of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) surface coal mining and reclamation regulatory program. The final SPR was revised in response to comments and recognizes that permit applicants and regulatory authorities may achieve ESA compliance by various means. Nothing in the rule accords the FWS the power to "veto" approval of permit applications. Rather, the SPR and new 2016 Biological Opinion create regulatory certainty for Industry by providing States, coal companies, and miners with a clear and expeditious process for obtaining ESA authorization for incidental take of threatened and endangered species during surface coal mining and reclamation operations.

7. Myth: The compliance cost for industry to implement the SPR would be prohibitive.

   Fact: In fact the costs of implementing SPR are not significant. The regulatory impact analysis for the SPR estimates that total industry SPR compliance costs will average $81 million per year ($71 million for surface mines and $10 million for underground mines), which is approximately 0.3% of total estimated coal company revenues in 2015. Compliance costs for surface mines with 1,250 or fewer employees will range between 0.1 and 3.1% of total company revenues, depending upon the region in which the mine is located, while compliance costs for underground mines with 1,500 or fewer employees will range between 0.0 and 0.1% of total company revenues, depending upon the region in which the mine is located.

8. Myth: The SPR will result in severe (15-35%) reductions in tax revenues in coal states.

   Fact: The regulatory impact analysis for the SPR predicts that the rule will result in an average annual reduction in coal production of 0.7 million tons, which is 0.08% of baseline production. That reduction will consist of 0.2 million tons of surface-mined coal (0.04% of baseline surface mine production) and 0.5 million tons of underground-mined coal (0.14% of baseline underground mine production). According to the regulatory impact analysis, such a reduction in coal production will result in an estimated aggregate reduction in state coal severance tax revenues of $995,000 per year. For context, state governments collected over $0.9 billion in coal severance tax revenues across the United States in 2015. Therefore these anticipated impacts represent less than 1% of annual severance tax collections.

With respect to other taxes (such as ad valorem taxes, workers compensation taxes, corporate income taxes, sales and use taxes, reclamation fees, and black lung fees) that are related to the level of coal production, the regulatory impact analysis states that similar impacts could also be expected in some regions.

9. Myth: The SPR will severely limit the availability of coal to electric generating units that could negatively impact electricity customers.

   Fact: The impact of the final SPR on a household's monthly electric bill is negligible. Average wholesale electricity prices are expected to increase by approximately 0.02%, which means a household using 900 kWh paying $113/ month would pay about 2 cents more per month.

1310 L Street, NW, 7th Floor
Washington, DC 20005
cei.org

202 331 1010 main
202 331 0640 fax

COMPETITIVE ENTERPRISE INSTITUTE
Advancing Liberty from the Economy to Ecology

January 31, 2017

The Honorable Paul Ryan
Speaker
U.S. House of Representatives
H-232, U.S. Capitol
Washington, DC 20515

The Honorable Mitch McConnell
Majority Leader
U.S. Senate
317 Russell Senate Office Building
Washington, DC 20510

Dear Speaker Ryan and Majority Leader McConnell:

On behalf of the Competitive Enterprise Institute (CEI), we write to express CEI's support for using the Congressional Review Act to repeal the U.S. Department of Interior's Stream Protection Rule, a coal mining regulation issued under the Obama administration. CEI supports this resolution of disapproval because the stream buffer zone rulemaking demonstrated much that is wrong with the regulatory state.

This rule is supposed to replace a rule promulgated by the George W. Bush administration. At the outset of President Obama's presidency, the Interior Department simply revoked the Bush rule, but a federal court blocked this action because it bypassed procedural safeguards. As a result, the Obama administration undertook a seven-year rulemaking, and the final Stream Protection Rule was issued during Obama's lame duck session.

This timing raises an obvious question: If the Bush rule was so inadequate to protect the environment, then why did the administration spend so much time on the replacement rule? Further, the rulemaking itself was characterized by an unacceptable absence of transparency.

After reports of job losses connected to the rule made the news, the House Natural Resources Committee was repeatedly rebuffed in its efforts to oversee the rulemaking. The Interior Department even ignored subpoenas issued by the committee. Eight of ten states withdrew from agreements to cooperate on the rule because the Interior Department would not share key information, and the Interior Department subsequently ignored a letter from 19 states requesting that it re-engage with them on the rule.

By themselves, these procedural abuses would be sufficient grounds for lawmakers to prevent the Stream Protection Rule from taking effect. But the rule itself is also bad policy. The rule would have a profound impact on coal miners and threaten one-third of the nation's coal mining workforce.

The entire point of the Surface Mining Control and Reclamation Act is to sanction surface mining. But Obama's rule would effectively preclude mining in much of the steep terrain of Appalachia—hitting this region's economy the hardest. This is contrary to the law's fundamental purpose.

We urge you and your colleagues in Congress to pass this joint resolution of disapproval under the Congressional Review Act and to eliminate the Interior Department's harmful Stream Protection Rule. Thank you for your careful consideration of this issue.

Sincerely,

Kent Lassman
President & CEO
Competitive Enterprise Institute

William Yeatman
Senior Fellow
Competitive Enterprise Institute

Remarks by President Trump at Signing of H.J. Resolution 38

ENERGY & ENVIRONMENT

Issued on: February 16, 2017

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ALL NEWS

Roosevelt Room

3:43 P.M. EST

THE PRESIDENT: Okay. We had an exciting news conference before. And some people loved it. I think nobody hated it, but it was — I think it was very productive. And thank you all for being there, that was very nice. And thank you, all of the wonderful politicians, but — right, Mitch, especially the miners that are with us, right? So I just want to thank you. Seriously. (Applause.) We appreciate it. We appreciate it very much.

And this is our second bill signing this week as we continue to work for the American people. This is H.J. Resolution 38, and that will eliminate another terrible job-killing rule, saving many thousands of American jobs, especially in the mines, which I've been promising you. The mines are a big deal. I've had support from some of you folks right from the very beginning, and I won't forget it. I went to West Virginia and I — we had 17,000, 18,000 people that couldn't get into that big arena, right? You were a few of them. But that was some day and some night.

I want to thank Senate Majority Leader Mitch McConnell, House Speaker Paul Ryan, House Majority Leader Kevin McCarthy, House Natural Resources Committee Chairman Rob Bishop — thank you, Rob — and Representative Bill Johnson, who worked very hard on this bill. And they really did, they worked very hard. This was a tough one.

I also want to thank the great members of Congress who have joined us today. We have a lot of them. In eliminating this rule, I am continuing to keep my promise to the American people to get

rid of wasteful regulations that do nothing — absolutely nothing — but slow down the economy, hamstring companies, push jobs to other countries — which is happening all over, although I must tell you, we've stopped it. You've seen all the factories, all the plants that are moving back. They're going back to a lot of places. So you know that, right, fellas? They're moving back fast. Ford, General Motors, Fiat — so many. Very happy.

Compliance costs for this rule would be over $50 million a year for the coal industry alone, and it's unnecessary. I want to also thank the incredible coal miners who are with us today. I think we can maybe thank them the most, right, for — political leaders. (Applause.) You folks have put up with a lot. And you know, in other countries, they love their coal. Over here, we haven't treated it with the respect it deserves. Even for defense, having that coal is a very important thing for us. So I want to thank you all.

This rule we're eliminating it's a major threat to your jobs, and we're going to get rid of that threat immediately. We're going to fight for you like I promised I would in the campaign. And you were very good to me, and I'm going to be even better to you, I promise you that.

And we're going to fight for, also, low-energy prices for all Americans. There's a spirit of optimism rising across the country. It's going to continue to grow as we sign more and more bills. We're going to make our nation more than competitive — not just competitive, we're going to be more than competitive. And we're going to win at many, many industries. We're already starting back with the automobile industry. We had the airline industry in the other day. They have rules and regulations that by the time they get through it, it's — nothing left, and they have to get rid of a lot of jobs. We had a great meeting, actually.

We had the unions in. We had the workers in. We had a lot of people in, and they were all very excited about what's happening. And I haven't looked yet at the stock market, but it's been going up at record clips. We have a tremendous streak going on. And that's only because of the optimism. They feel the optimism. And that optimism is creating a lot of jobs.

So it's an honor to have everybody with us, and, in particular, the miners. We appreciate everything you've done, fellas. Thank you very much.

Would anybody like to say a few words? How about one of the miners saying a few words? I hear these guys all the time. I hear Rand all the time. (Laughter.) Come on. Who'd like to — come on, Mike.

MR. NELSON: President Trump, we thank you very much for everything you've done for us. Everything that you're doing for our industry is very much needed. I've been mining in this industry for 40 years, and this is a very exciting time for our industry. Thank you very much.

THE PRESIDENT: Thank you very much.

SENATOR MANCHIN: Tell him where you're from, Mike.

MR. NELSON: I'm from Morgantown, West Virginia, but I work at the Marion County Coal Company.

THE PRESIDENT: How did I do in that area?

MR. NELSON: Oh, you did great. (Laughter and applause.)

THE PRESIDENT: Good. Good. Say something.

CONGRESSWOMAN CAPITO: Well, President Trump —

THE PRESIDENT: You're a — you represent.

CONGRESSWOMAN CAPITO: Yes. Representing West Virginia as the Senator, and Senator Manchin and I, and we have our congressional delegation here — Congressman Jenkins, Congressman McKinley, and Congressman Mooney. This is a lifeline to us, and these miners, they mine in West Virginia. It's a source of pride for us as a state that we've been able to power this country, and that we've had the opportunity to provide the energy to this country. And thank you for being a partner with us and being a leader, President Trump, in this. We believe in this, and we believe in your commitment to making sure American miners get back to work. Thank you.

THE PRESIDENT: Thank you. (Applause.)

SENATOR PAUL: This is a big day for Kentucky. We want to thank President Trump for getting rid of this job-killing regulation. It was scheduled to cost us thousands of more jobs. Nobody seemed to care about Kentucky, but I can promise you, Eastern Kentucky voted about 75 percent for Donald J. Trump. (Applause.)

SENATOR MANCHIN: Let me just say something very quickly. There's not a miner here that's not an environmentalist. So when people say that we don't want to do the right thing — there's a balance between the environment and the economy, these miners would be the first ones to tell you. They're out in the woods, they're hunting, they're fishing, they're doing everything possible. All they want is the respect that — basically they've given us the country we have because of the hard work of them and their fathers and grandfathers and all of their family has done.
So I'm so proud. These are all West Virginians too. Makes it even prouder for all of us. So thank you. God bless you.

LEADER MCCONNELL: Well, Mr. President, you know that the last eight years brought a depression — a depression — to Eastern Kentucky, and our folks are so excited to have a pro-coal President. And we thank you so much for being on our side. (Applause.)

THE PRESIDENT: Anybody else? Come on. Sure. Absolutely. You deserve it.

LEADER MCCONNELL: Thank you, Mr. President.

THE PRESIDENT: You deserve it. Come on up.

PARTICIPANT: Well, Mr. President, this is an example of what you talked about so much during your campaign. This is what is going to make America great again. This is the legislative branch and you working together to keep the promise that you made to put coal miners back to work and to save the coal industry. If we had not overturned this rule, we were looking at nearly 70,000 jobs across the country, and about 80 percent of our coal reserves being unavailable. So thank you for your willingness to work with us to get this done. It's very, very important to the coal miners of this country and to our electricity grid. Thank you, Mr. President. (Applause.)

PARTICIPANT: As a 45-year miner, I'm very proud to be in this historic building, and I am very proud to be here with my President of the United States, who keeps his word. And we thank you very much, sir.

THE PRESIDENT: It's a great honor. (Applause.)

So I want to thank everybody. And tell your friends back in West Virginia and Kentucky and all the other places where we worked — Wyoming —

SENATOR HEITKAMP: North Dakota.

REPRESENTATIVE JORDAN: Ohio.

THE PRESIDENT: North Dakota. Ohio.

REPRESENTATIVE LAMBORN: Colorado.

THE PRESIDENT: You're right about that. They have been fantastic. Everybody's been — actually, everybody's been great, and we appreciate it very much. Special people. Special workers. We're bringing it back, and we're bringing it back fast. We didn't have to wait a long period of time. It's been very few days since I've been here, and I think this is long ahead of schedule, right? Wouldn't you say even —

SENATOR MANCHIN: Absolutely.

THE PRESIDENT: Even you might say — (laughter) — this is about four years faster than they thought would have happened. So it’s my honor. And, fellas, go back to work, all right? I think we’ll take them into the Oval Office, right? Let’s take them into the Oval Office. Let’s have a little tour, okay? They’ve probably been there many times before. (Laughter.) Come on. Come with me. Good.

Thank you, everybody. Thank you, very much.

AIDE: Sign the bill here.

THE PRESIDENT: Oh. (Laughter.) I could have gotten away with it.

PARTICIPANT: It’s the important part.

(The President signs the bill.)

END
3:53 P.M. EST

**IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA
AT HUNTINGTON**

OHIO VALLEY ENVIRONMENTAL
COALITION, WEST VIRGINIA
HIGHLANDS CONSERVANCY,
WEST VIRGINIA RIVERS COALITION,
and SIERRA CLUB,

Plaintiffs,

v. CIVIL ACTION NO. 2:17-cv-03013

FOLA COAL COMPANY, LLC,

Defendant.

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

INTRODUCTION

1. This is a citizen suit for declaratory and injunctive relief against Defendant Fola Coal Company, LLC ("Fola") for violations of the Federal Water Pollution Control Act, 33 U.S.C. § 1251 et seq. (hereafter the Clean Water Act ("CWA")), and the Surface Mining Control and Reclamation Act, 30 U.S.C. § 1201 et seq. (hereafter "SMCRA"), at its Surface Mine No. 4A and Bullpen Surface Mine in Clay and Nicholas Counties, West Virginia.

2. As detailed below, Plaintiffs allege that Fola has discharged and continues to discharge pollutants into waters of the United States in violation of Sections 301 and 401 of the CWA, 33 U.S.C. §§ 1311, 1341, and the conditions and limitations of its West Virginia/National Pollution Discharge Elimination System ("WV/NPDES") Permit Nos. WV1013815 and WV1017934 issued pursuant to Section 402 of the CWA, 33 U.S.C. § 1342.

3. Plaintiffs further allege that Fola's discharges of pollutants into waters adjacent to Surface Mine No. 4A and the Bullpen Surface Mine violate the performance standards under

SMCRA and the terms and conditions of its surface mining permit Nos. S200502 and S200798.

JURISDICTION AND VENUE

4. This Court has jurisdiction over this action pursuant to 28 U.S.C. § 1331 (federal question), 33 U.S.C. § 1365 (CWA citizen's suit provision), and 30 U.S.C. § 1270 (SMCRA citizens' suit provision).

5. On March 1, 2017, Plaintiffs gave notice of the violations and their intent to file suit to the Defendant, the United States Environmental Protection Agency ("EPA"), the Office of Surface Mining Reclamation and Enforcement ("OSMRE"), and the West Virginia Department of Environmental Protection ("WVDEP"), as required by Section 505(b)(1)(A) of the CWA, 33 U.S.C. § 1365(b)(1)(A), and Section 520(b)(1)(A) of SMCRA, 30 U.S.C. § 1270(b)(1)(A).

6. More than sixty days have passed since the notice was sent. EPA, OSMRE, and/or WVDEP have not commenced or diligently prosecuted a civil or criminal action to redress the violations. Moreover, neither EPA nor WVDEP commenced an administrative penalty action under Section 309(g) of the CWA, 33 U.S.C. § 1319(g), or a comparable state law to redress the violations prior to the issuance of the March 1, 2017 notice letter.

7. Venue in this District is proper pursuant to 33 U.S.C. § 1365(c)(1) because the sources of the CWA violations are located in this District, and pursuant to 30 U.S.C. § 1270(c) because the coal mining operations complained of are located in this District.

PARTIES

8. Fola is a West Virginia Limited Liability Company engaged in the business of mining coal.

9. Fola is a person within the meaning of Section 502(5) of the CWA, 33 U.S.C. § 1362(5), and Section 701(19) of SMCRA, 30 U.S.C. § 1291(19).

10. At all relevant times, Fola has owned and operated Surface Mine No. 4A and the Bullpen Surface Mine in Nicholas and Clay Counties of West Virginia. The mines are regulated pursuant to Surface Mining Permit S200502 and S200798, respectively, and discharge pollutants into the Right Fork of Leatherwood Creek of the Elk River, subject to the effluent limits in WV/NPDES Permit Nos. WV1013815 and WV1017934, respectively.

11. Plaintiff Ohio Valley Environmental Coalition is a nonprofit organization incorporated in Ohio. Its principal place of business is in Huntington, West Virginia. It has approximately 1,500 members. Its mission is to organize and maintain a diverse grassroots organization dedicated to the improvement and preservation of the environment through education, grassroots organizing, coalition building, leadership development, and media outreach. The Coalition has focused on water quality issues and is a leading source of information about water pollution in West Virginia.

12. The West Virginia Highlands Conservancy, Inc. is a nonprofit organization incorporated in West Virginia in 1967. Its volunteer board of directors and approximately 1,500 members work for the conservation and wise management of West Virginia's natural resources. As one of West Virginia's oldest environmental activist organizations the West Virginia Highlands Conservancy is dedicated to protecting our clean air, clean water, forests, streams, mountains, and the health and welfare of the people that live here and for those who visit to recreate.

13. Plaintiff West Virginia Rivers Coalition makes its mission the conservation and restoration of West Virginia's exceptional rivers and streams. It not only seeks preservation of high quality waters, but also the improvement of waters that should be of high quality. It has approximately 2,500 members.

14. Plaintiff Sierra Club is a nonprofit corporation incorporated in California, with more than 740,000 members and supporters nationwide including approximately 2,400 members who reside in West Virginia and belong to its West Virginia Chapter. The Sierra Club is dedicated to exploring, enjoying, and protecting wild places of the Earth; to practicing and promoting the responsible use of Earth's resources and ecosystems; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Sierra Club's concerns encompass the exploration, enjoyment and protection of surface water in West Virginia.

15. Plaintiffs have members including Cindy Rank, James Tawney and Angie Rosser, who use, enjoy, and benefit from the water quality in Leatherwood Creek, its tributaries, and downstream portions of the Elk River. They would like to recreate in areas downstream from the portion of the streams into which Fola's Surface Mine No. 4A and Bullpen Surface Mine discharge pollutants harmful to aquatic life, including total dissolved, conductivity and sulfate. Excessive amounts of these pollutants degrade the water quality of Leatherwood Creek and its tributaries, make the water aesthetically unpleasant and environmentally undesirable and impair its suitability for aquatic life. Because of this pollution, Plaintiffs' members refrain from and/or restrict their usage of Leatherwood Creek, its tributaries, downstream portions of the Elk River and associated natural resources. As a result, the environmental, health, aesthetic, and recreational interests of these members are adversely affected by Fola's excessive discharges of these and other pollutants into Leatherwood Creek and its tributaries from its Surface Mine No. 4A and Bullpen Surface Mine in violation of its WV/NPDES permits, its Section 401 certifications, and its SMCRA permits. If Fola's unlawful discharges ceased, the harm to the interests of Plaintiffs' members would be redressed. An injunction would redress Plaintiffs'

members' injuries by preventing future violations of the limits in Fola's permits and certifications.

16. At all relevant times, Plaintiffs were and are "persons" as that term is defined by the CWA, 33 U.S.C. § 1362(5) and SMCRA, 30 U.S.C. § 1291(19).

STATUTORY AND REGULATORY FRAMEWORK

17. Section 301(a) of the CWA, 33 U.S.C. § 1311(a), prohibits the "discharge of any pollutant by any person" into waters of the United States except in compliance with the terms of a permit, such as a NPDES permit issued by EPA or an authorized state pursuant to Section 402 of the CWA, 33 U.S.C. § 1342.

18. Section 401 of the CWA, 33 U.S.C. § 1341, and 33 C.F.R. § 330.4(c), provide that before the U.S. Army Corps of Engineers (the Corps) may issue a nationwide permit under Section 404(e) of the CWA, 33 U.S.C. § 1344(e), authorizing discharges of fill material into waters of the United States, it must obtain a certification from the state that the discharges will not violate that state's water quality standards.

19. Section 402(a) of the CWA, 33 U.S.C. § 1342(a), provides that the permit-issuing authority may issue a NPDES Permit that authorizes the discharge of any pollutant directly into waters of the United States, upon the condition that such discharge will meet all applicable requirements of the CWA and such other conditions as the permitting authority determines necessary to carry out the provisions of the CWA.

20. Section 303(a) of the CWA, 33 U.S.C. § 1313(a) requires that states adopt ambient water quality standards and establish water quality criteria for particular water bodies that will protect designated uses of the water.

21. The Administrator of EPA authorized WVDEP, pursuant to Section 402(a)(2) of the Act, 33 U.S.C. § 1342(a)(2), to issue NPDES permits on May 10, 1982. 47 Fed. Reg. 22363. The applicable West Virginia law for issuing NPDES permits is the Water Pollution Control Act ("WPCA"), W.Va. Code § 22-11-1, et seq.

22. Section 505(a) of the CWA, 33 U.S.C. § 1365(a), authorizes any "citizen" to "commence a civil action on his own behalf . . . against any person. . . who is alleged to be in violation of . . . .an effluent standard or limitation under this chapter."

23. Section 505(f) of the CWA, 33 U.S.C. § 1365(f), defines an "effluent standard or limitation under this chapter," for purposes of the citizen suit provision in Section 505(a) of the CWA, 33 U.S.C. § 1365(a), to mean, among other things, an unlawful act under Section 301(a) of the CWA, 33 U.S.C. § 1311(a), a certification under Section 401 of the CWA, 33 U.S.C. § 1341, and "a permit or condition thereof issued" under Section 402 of the CWA, 33 U.S.C. § 1342.

24. In an action brought under Section 505(a) of the CWA, 33 U.S.C. § 1365(a), the district court has jurisdiction to order the defendant to comply with the CWA.

25. Under Section 505(d) of the CWA, 33 U.S.C. § 1365(d), the court "may award costs of litigation (including reasonable attorney and expert witness fees) to any prevailing or substantially prevailing party, whenever the court determines such an award is appropriate."

26. Section 506 of SMCRA, 30 U.S.C. § 1256, prohibits any person from engaging in or carrying out surface coal mining operations without first obtaining a permit from OSMRE or from an approved state regulatory authority.

27. At all relevant times, the State of West Virginia has administered an approved surface mining regulatory program under SMCRA. *See* 30 C.F.R. § 948.10.

28. Among the performance standards mandated by SMCRA and the West Virginia Surface Coal Mining and Reclamation Act ("WVSCMRA") is that "[d]ischarge from areas disturbed by . . . mining shall not violate effluent limitations or cause a violation of applicable water quality standards." 30 C.F.R. §§ 816.42 and 817.42; 38 C.S.R. § 2-14.5.b.

29. The performance standards further require that "[a]ll surface mining and reclamation activities shall be conducted . . . to prevent material damage to the hydrologic balance outside the permit area." 38 C.S.R. § 2-14.5. At a minimum, "material damage" includes violations of water quality standards.

30. The legislative rules promulgated under WVSCMRA provide that, as a general condition of all surface mining permits issued under the WVSCMRA, the permittee must comply with all applicable performance standards. 38 C.S.R. § 2-3.33.c.

31. Section 520(a) of SMCRA, 30 U.S.C. § 1270(a), authorizes any person adversely affected to bring an action in federal court to compel compliance with SMCRA against any "person who is alleged to be in violation of any rule, regulation, order or permit issued pursuant to [SMCRA]."

32. Section 520(d) of SMCRA, 30 U.S.C. § 1270(d), authorizes the Court to award the costs of litigation, including attorney fees and expert witness fees, "to any party, whenever the court determines such an award is appropriate."

33. WVDEP is the agency in the State of West Virginia that administers the State's CWA and SMCRA programs and issues WV/NPDES Permits, Section 401 certifications, and WVSCMRA Permits.

FACTS

34. Fola's mining activities at Surface Mine No. 4A are regulated under West Virginia Surface Mining Permit S200502. That Permit was renewed in 2014 and remains in effect.

35. Fola's mining activities at its Bullpen Surface Mine are regulated under West Virginia Surface Mining Permit S200798. That permit was renewed in 2014 and remains in effect.

36. On October 24, 2003, the Corps issued an authorization to Fola under § 404(e) of the CWA, 33 U.S.C. § 1344(e), and the 2002 Nationwide Permit (NWP) 21 for Fola's stream-impacting activities at its Surface Mine No. 4a.

37. On February 21, 1999, the Corps issued an authorization to Fola under § 404e) of the CWA, 33 U.S.C. § 1344(e), and the 1996 NWP 21 for Fola's stream-impacting activities at its Bullpen Surface Mine.

38. Fola's water discharge activities at Surface Mine No. 4A are regulated under WV/NPDES Permit No. WV1013815. That permit was reissued in 2014 and remains in effect.

39. Fola's water discharge activities at its Bullpen Surface Mine are regulated under WV/NPDES Permit No. WV1017934. That permit was reissued in 2014 and remains in effect.

40. Part C of WV/NPDES Permit Nos. WV1013815 and WV1017934 incorporate by reference 47 C.S.R. § 30-5.1.f, which provides that: "The discharge or discharges covered by a WV/NPDES permit are to be of such quality so as not to cause violation of applicable water quality standards adopted by the Department of Environmental Protection, Title 47, Series 2." WVDEP's narrative water quality standards prohibit discharges of "[m]aterials in concentrations which are harmful, hazardous or toxic to man, animal or aquatic life" or that cause "significant

adverse impacts to the chemical, physical, hydrologic, or biological components of aquatic ecosystems." 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

Violations of Water Quality Standards at Fola's Surface Mine 4A

41. Permit No. WV1013815 regulates discharges from Outlets 020 through 031 of Surface Mine No. 4A, which discharge into two tributaries of Leatherwood Creek—Right Fork and Cannel Coal Hollow. Leatherwood Creek is a tributary of the Elk River.

42. Outlets 020-031 are divided between two streams—Cannel Coal Hollow and Right Fork. Outlets 022 and 023 discharge into the upstream end of Right Fork. Outlets 024, 021, 025, 020, and 028 are located on Right Fork downstream from those two Outlets. Outlet 027 discharges into the upstream end of Cannel Coal Hollow. Outlets 026, 031, 030, and 029 are located on Cannel Coal Hollow downstream from Outlet 027. Outlets numbered less than 020, such as 001, 002, 003, and 004, were terminated in 1994-95 and 2006 and are no longer listed in the 2014 permit. Fola's discharge monitoring reports since January 2015 show that the Outlets other than 022, 023 and 027 had no flow or were not constructed. Thus, no outlet currently discharges into Cannel Coal Hollow, and only Outlets 022 and 023 currently discharge into Right Fork.

43. Prior to mining at Surface Mine No. 4A, Right Fork was unimpaired. In its 2003 Cumulative Hydrogic Impact Assessment (CHIA) for that mine, WVDEP stated that though some sub-watersheds of Right Fork had elevated manganese and sulfates related to pre-Fola mining, the upper reaches of the watershed had low levels of sulfates. WVDEP also stated in the CHIA that "all [monitoring] stations provide adequate habitat and contain populations of benthic macroinvertebrates. All the stations have high EPT indices." Prior to mining at Surface Mine No. 4A, the majority of water samples in Right Fork showed conductivity levels below 300

µS/cm.

44. Prior to mining at Surface Mine No. 4A, WVDEP reported a WVSCI score of 84 for Right Fork. In 2000 and 2001, Fola's consultant collected a number of biological surveys from seventeen different sampling locations. Among thirty-three samples from those seventeen sites, only six had WVSCI scores below 68.

45. Since Fola began mining activities at Surface Mine No. 4A in 2001, conductivity levels in Right Fork have been almost entirely above 1,500 µS/ cm, with jumps up to and exceeding 2,500 µS/cm. Similarly, since 2001, sulfate levels have been consistently above 600 mg/l, and sometimes as high as 1,200 mg/l.

46. In 2011 and 2012, discharges from Outlets 022, 023, and 027 at Surface Mine No. 4A consistently ranged from 1,500 µS/cm to more than 3,000 µS/cm. In May and September 2014, conductivity from the three discharges ranged from 1820 to 2,958 µS/ cm, with sulfate levels between 920 and 1,800 mg/l.

47. The following table summarizes pre- and post-mining water quality at Surface Mine No. 4A, with measurements from Boardtree Branch as a comparison point for water chemistry characteristic of alkaline mine drainage:

	Table 1. Chemical Composition of Alkaline Mine Drainage										
	Location	pH	Cond-uctivity	Alkalinity (as CaCO3)	Hardness (as CaCO3)	Ca	Mg	Na	K	Cl	SO_4
Pre-mining	FOLA-6 (2001)	7.15	461	22	189	34	25	8	3	3	120
	FOLA-7 (2001)	7.35	367	22	396	34	75	2	3	1	110
Post-mining	BASD3RLW (2012)	8.38	1689	124	n/a	265	211	30	16	n/a	1150
	BASD1RLW (2012)	8.17	1538	93	n/a	202	156	31	14	n/a	942

	Outlet 022 (Hansen 2014)	7.9	1820	120		140	120	62	12	32	920
	Outlet 023 (Hansen 2014)	8.1	2720	150		280	260	100	16	ND	180
Referen ce	Boardtree Branch	8.0	2367	72	1408	241	260	12	21	11	1580

48. High levels of conductivity, dissolved solids, alkalinity, and ionic chemicals (including sulfates, bicarbonate, magnesium and calcium) are a primary cause of water quality impairments downstream from mine discharges.

49. In 2011, EPA scientists summarized the existing science connecting conductivity and biological degradation in an EPA report entitled, "A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams." That report, which was peer-reviewed by scientists on EPA's Science Advisory Board, used EPA's standard method for deriving water quality criteria to derive a conductivity benchmark of 300 µS/cm. *Id*. at xiv-xv. According to the species sensitivity distribution in the benchmark, on average, five percent of species are lost when conductivity rises to 295 µS/cm, over 50% are lost at 2000 µS/cm, and close to 60% are lost at 3000 µS/cm. *Id*. at 18. EPA found that the loss of aquatic species from increased conductivity was "a severe and clear effect." *Id*. at A-37. A statistical analysis included in the benchmark determined that at a conductivity level of 300 µS/cm a stream has a59% likelihood of beingbe impaired and at 500 µS/cm a stream has a 72% likelihood of being impaired. *Id*. at A-36.

50. The EPA Benchmark report is supported by more recent peer-reviewed studies. Cormier, et al., Derivation of a Benchmark for Freshwater Ionic Strength, Environmental Toxicology and Chemistry, 32(2): 263-271 (2013), and references cited therein; Bernhardt, et al., "How Many Mountains Can We Mine? Assessing the Regional Degradation of Central Appalachian Rivers by Surface Coal Mining," Environmental Science & Technology, 46 (15), pp. 8115–8122 (2012). The latter study's authors found that:

> The extent of surface mining within catchments is highly correlated with the ionic strength and sulfate concentrations of receiving streams. Generalized additive models were used to estimate the amount of watershed mining, stream ionic strength, or sulfate concentrations beyond which biological impairment (based on state biocriteria) is likely. We find this threshold is reached once surface coal mines occupy >5.4% of their contributing watershed area, ionic strength exceeds 308 $\mu S\ cm^{-1}$, or sulfate concentrations exceed 50 mg/L.

51. The ions found coming out of Outlets 022 and 023 are consistent with those associated with coal mining pollution in this region (Pond et al. 2008; Palmer et al. 2010; Bernhardt and Palmer 2011; Lindberg et al. 2012; Pond et al. 2010; Pond et al. 2012; Pond et al. 2014; Kunz 2013). The ionic mixture of calcium, magnesium, sulfate, and biocarbonate in alkaline mine water causes the loss of aquatic macroinvertebrates in Appalachian areas where surface coal mining is prevalent; it is the mixture of ions that causes the biological impairment (Cormier et al. 2013b; Cormier and Suter 2013). This mixture also has significant adverse effects on fish assemblages (Hitt 2014; Hopkins 2013) and has toxic effects on aquatic life, including mayflies (Kunz 2013; Echols 2010; Kennedy 2004).

52. On May 9, 2014, Dr. Christopher Swan conducted field sampling downstream of Outlets 022 and 023 and measured a WVSCI score of 38.21 and a GLIMPSS score of 25.79.

53. WVDEP has listed Right Fork and Leatherwood Creek as biologically impaired due to mining on its 2012 and 2014 CWA Section 303(d) Lists.

54. WVDEP stated in its Elk River Watershed TMDL that "[i]n [Right Fork/Leatherwood Creek] ..., the [stressor identification] process determined ionic toxicity to be a significant stressor. A strong presence of sulfates and other dissolved solids exists in those waters and in all other streams where ionic toxicity has been determined to be a significant biological stressor."

55. Since January 2015, Fola has discharged the following average conductivity (in μS/cm) from Outlets 022 and 023:

Table 2		
Average Conductivity		
	023	**022**
Jan-15	1985	1450
Feb-15	3510	2075
Mar-15	2715	1790
Apr-15	2925	1820
May-15	2955	2235
Jun-15	3185	2030
Jul-15	2290	1750
Aug-15	2725	1930
Sep-15	2690	1805
Oct-15	2555	1940
Nov-15	2210	1620
Dec-15	3235	1885
Jan-16	2325	1645
Feb-16	2030	1440
Mar-16	3030	1820
Apr-16	2750	1855
May-16	2850	1745
Jun-16	2870	1690
Jul-16	2760	1755
Aug-16	2935	1705
Sep-16	3065	1865

56. Thus, Fola is continuing to discharge high levels of ionic pollutants, measured as conductivity, from Outlets 022 and 023 and that those discharges are causing or materially contributing to biological impairment in Right Fork.

Violations of Water Quality Standards at Bullpen Surface Mine

57. Fola's WV/NPDES Permit No. WV1017934 regulates discharges from Outlets 001 through 009, which are located on or near Bullpen Fork. Bullpen Fork is a tributary of Right Fork, and enters that stream downstream from the stream in Cannel Coal Hollow

58. Fola's discharge monitoring reports since January 2015 show that the Outlets 002, 003, 004, and 005 had no flow or were not constructed. Outlets 007 and 008 are not listed on Fola's DMRs or in its permit. Thus, Outlets 001 and 009 are the only reported contributors to flow in Bullpen Fork.

59. The 2005 CHIA for the Bullpen Surface Mine stated that "[t]he major drainage control structure for Permit S-2007-98 is Pond #1 (NPDES Outlet 009), an in-stream pond in Bullpen Fork."

60. This CHIA also stated that prior to mining, "Bullpen Fork shows very little impact from previous mining." Pre-mining, sulfates in that stream were from 18-60 mg/l. On October 27, 1998, a pre-mining benthic survey in Bullpen Fork and Right Fork found that "Bullpen Fork supports a healthy population of pollution 'intolerant' families of benthic macroinvertebrates including mayflies, stoneflies and caddisflies" and was non-impaired. That survey further found that "there are no significant sources of pollution or other environmental stress factors within either of the streams sampled," and "[a]ll of the stations appear to represent 'normal' stream conditions that have not been impacted by previous mining activities and/or other form of impairment."

61. In May 2014, EnviroScience sampled benthic macroinvertebrates at three sites on Bullpen Fork and Right Fork. Site DBAS-BP was at the mouth of Bullpen Fork just upstream of its confluence with Right Fork. Site UBAS1-RFLC was on Right Fork upstream of its confluence with Bullpen Fork. Site DBAS1-RFLC was on Right Fork downstream of its confluence with Bullpen Fork. EnviroScience measured the WVSCI scores at these three sites as 48.8, 53.1, and 49.1, respectively, which are all less than a passing score of 68 and demonstrate biological impairment in violation of water quality standard and Fola's permit condition.

62. At the time of the May 2014 sampling, EnviroScience measured the water quality at these three locations as shown below:

Table 3								
Site	**pH**	**Conductivity**	**Alkalinity**	**Ca**	**Mg**	**Na**	**K**	**SO_4**
DBAS-BP	6.91	1360	ND	138	101	5.6	8.19	635
UBAS-RFLC	7.83	2390	90.5	249	204	76.5	14.7	1070
DBAS-RFLC	7.79	2250	78.6	233	187	62	13.6	1210

63. Since January 2015, Fola has reported the following levels of conductivity (in µS/cm) at Outlets 001 and 009:

Table 4		
Average Conductivity		
	001	**009**
Jan-15	849	1805
Feb-15	709	1740
Mar-15	596	1380
Apr-15	651	1590
May-15	733	2068
Jun-15	920	2255
Jul-15	845	1915
Aug-15	865	1980
Sep-15	1010	2024
Oct-15	1090	1790
Nov-15	1080	2360
Dec-15	1170	2145
Jan-16	916	1825
Feb-16	668	1723
Mar-16	721	1760
Apr-16	835	1740
May-16	685	1750
Jun-16	893	1840
Jul-16	766	1860
Aug-16	955	1800
Sep-16	1090	2006

64. These recent conductivity levels are far above EPA's benchmark of 300 µS/cm. Fola's discharges of these high levels of ionic pollutants, measured as conductivity, are causing or materially contributing to biological impairment in Bullpen Fork, Right Fork and Leatherwood Creek.

65. In its most recent DMRs, Fola has reported the levels of instream conductivity listed below. From top to bottom, the table lists values starting at the upper reaches of Right Fork and then moves downstream to Leatherwood Creek, into which Right Fork flows. The table shows that throughout this entire reach, the conductivity is consistently over 1500 µS/cm, far in excess of EPA's benchmark of 300 µS/cm:

Table 5—Instream Conductivity Measurements

Site	**Location**	**Months**			
		6/16	**7/16**	**8/16**	**9/16**
DCCH (P-9)	Near mouth of Cannel Coal Hollow	2160	2475	2300	2335
DRFLC (P-10)	On Right Fork below Cannel Coal Hollow	2150	2475	2175	2565
DSBF	Near the mouth of Bullpen Fork	1810	n/a	1580	2405
DRFLC (P-11)	Near the mouth of Right Fork and below Bullpen Fork	2150	2105	2145	2285
DRLC (P-12)	On Leatherwood Creek below its confluence with Right Fork	2150	2045	2175	2275

66. Thus, Fola's discharges of ionic pollutants, measured as conductivity, are causing or materially contributing to violations of water quality standards in Right Fork of Leatherwood Creek, Bullpen Fork and Leatherwood Creek.

FIRST CLAIM FOR RELIEF
(CWA Permit Violations)

67. Plaintiffs incorporate by reference all allegations contained in paragraphs 1 through 66 above.

68. Since at least January 2015, Fola's Surface Mine No. 4A and Bullpen Surface Mine have discharged pollutants from their mining operations through point sources, i.e. Outlets

022 and 023 at Surface Mine No. 4A and Outlets 001 and 009 at Bullpen Surface Mine, into Right Fork of Leatherwood Creek, Bullpen Fork, and Leatherwood Creek pursuant to WV/NPDES Permit Nos. WV1013815 and WV1017934.

69. Right Fork of Leatherwood Creek, Bullpen Fork, and Leatherwood Creek are waters of the United States within the meaning of 33 U.S.C. § 1362(7).

70. Since at least January 2015, Fola has discharged and continues to discharge pollutants which cause ionic stress and biological impairment in Right Fork of Leatherwood Creek, Bullpen Fork, and Leatherwood Creek in violation of the narrative water quality standards for biological integrity and aquatic life protection. 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

71. The narrative water quality standards for biological integrity and aquatic life protection incorporated by reference into Part C of Fola's WV/NPDES Permit Nos. WV1013815 and WV1017934 are "effluent standards or limitations" for purposes of Section 505(a)(1) and 505(f)(6) of the Clean Water Act because they are a condition of a permit issued under Section 402 of the Act. 33 U.S.C. §§ 1342, 1365(a)(1), 1365(f)(6).

72. Based on the WVSCI scores and measured concentrations of specific conductivity and sulfates in Fola's discharges, and its failures to take corrective actions to address those conditions, Plaintiffs believe and allege that Fola is in continuing and/or intermittent violation of its WV/NPDES Permit Nos. WV1013815 and WV1017934 and the CWA.

73. Fola is subject to an injunction under the CWA ordering it to cease its permit violations.

SECOND CLAIM FOR RELIEF
(CWA Certification Violations)

74. Plaintiffs incorporate by reference all allegations contained in paragraphs 1 through 66 above.

75. Before the Corps may issue a § 404 permit, it must obtain a certification from the state that the project will not violate that state's water quality standards. 33 U.S.C. § 1341 (CWA § 401).

76. WVDEP's § 401 certifications to the Corps for the 1996 and 2002 NWPs contained standard conditions that must be met at mines with NWP authorizations.

77. As shown above, Fola is violating Standard Conditions 3, 5 and 13 in WVDEP's two certifications for those NWPs. Condition 3 is that "[s]poil materials from the watercourse or onshore operations, including sludge deposits, will not be dumped into the watercourse or deposited in wetlands or other areas where deposit may adversely affect surface or ground waters of the state." Condition 5 is that "[f]ill is to be clean, nonhazardous, and of such composition that it will not adversely affect the biological, chemical or physical property of the receiving waters." Condition 13 is that "[t]he permittee will comply with water quality standards as contained in the West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 46, Series."

78. Fola's discharges and mining activities are violating these conditions by causing or materially contributing to chemical and biological impairment of the downstream waters, in violation of West Virginia water quality standards set forth at 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

79. Based on the WVSCI scores and measured concentrations of specific conductivity and sulfates in Fola's discharges, and its failures to take corrective actions to address those conditions, Plaintiffs believe and allege that Fola is in continuing and/or intermittent violation of the conditions in its § 401 certifications for its Surface Mine No. 4A and Bullpen Surface Mine.

80. Each violation of Fola's certifications is a violation of the CWA and is enforceable under the citizen suit provision of the CWA, 33 U.S.C. §§ 1365(a), (f)(5).

81. Fola is subject to an injunction under the CWA ordering it to cease its certification violations.

THIRD CLAIM FOR RELIEF
(SMCRA Violations)

82. Plaintiffs incorporate by reference all allegations contained in paragraphs 1 through 66 above.

83. Fola's WVSCMRA Permits S200502 and S200798 require it to comply with performance standards of the WVSCMRA. 38 C.S.R. § 2-3.33(c).

84. Those performance standards provide that "discharge from areas disturbed by surface mining shall not violate effluent limitations or cause a violation of applicable water quality standards." 38 C.S.R. § 2-14.5.b.

85. West Virginia water quality standards prohibit discharges of "[m]aterials in concentrations which are harmful, hazardous or toxic to man, animal or aquatic life" or that cause "significant adverse impacts to the chemical, physical, hydrologic, or biological components of aquatic ecosystems." 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

86. WVSCMRA performance standards also provide that "[a]ll surface mining and reclamation activities shall be conducted . . . to prevent material damage to the hydrologic balance outside of the permit area." 38 U.S.C. § 2-14.5. "Material damage," at a minimum includes violations of water quality standards.

87. By violating West Virginia water quality standards for biological integrity and aquatic life protection at its Surface Mine No. 4A and Bullpen Surface Mine, Fola has also violated, and is continuing to violate, the performance standards incorporated as conditions in its WVSCMRA Permits S200502 and S200798.

88. Federal and State performance standards require that, "[i]f drainage control, restabilization and revegetation of disturbed areas, diversion of runoff, mulching, or other reclamation and remedial practices are not adequate to meet the requirements of this section and § 816.42, the operator shall use and maintain the necessary water-treatment facilities or water quality controls." 30 C.F.R. § 816.41(d)(1); *see also*, 38 C.S.R. § 2-14.5.c ("Adequate facilities shall be installed, operated and maintained using the best technology currently available in accordance with the approved preplan to treat any water discharged from the permit area so that it complies with the requirements of subdivision 14.5.b of this subsection.").

89. The violations identified herein show that Fola's existing treatment methods are insufficient to meet that requirement. Thus the performance standards require Fola to construct a system that will effectively treat its effluent to levels that comply with all applicable water quality standards.

90. Each violation of Fola's WVSCMRA permits is a violation of SMCRA and is enforceable under the citizen suit provision of SMCRA, 30 U.S.C. § 1270(a).

91. Fola is subject to an injunction under SMCRA ordering it to cease its permit violations.

RELIEF REQUESTED

WHEREFORE, Plaintiffs respectfully request that this Court enter an Order:

1. Declaring that Fola has violated and is in continuing violation of the CWA and SMCRA;

2. Enjoining Fola from operating Surface Mine No. 4A and Bullpen Surface Mine in such a manner as will result in further violations of WV/NPDES Permit Nos. WV1013815 and WV1017934 and WVSCMRA permits S200502 and S200798;

3. Ordering Fola to immediately comply with the effluent limitations in WV/NPDES permit WV1013825 and WV1017934;

4. Ordering Fola to immediately comply with the terms and conditions of WVSCMRA permit S200502 and S200798;

5. Ordering Fola to conduct monitoring and sampling to determine the environmental effects of its violation, to remedy and repair environmental contamination and/or degradation caused by its violations, and restore the environment to its prior uncontaminated condition;

6. Awarding Plaintiffs their attorney and expert witness fees and all other reasonable expenses incurred in pursuit of this action; and

7. Granting other such relief as the Court deems just and proper.

Respectfully submitted,

/s/ J. Michael Becher
J. Michael Becher (WV Bar No. 10588)
Joseph M. Lovett (WV Bar No. 6926)
Appalachian Mountain Advocates
P.O. Box 507
Lewisburg, WV 24901
(304) 382-4798
mbecher@appalmad.org
jlovett@appalmad.org

Counsel for Plaintiffs

DEPARTMENT OF THE INTERIOR

Office of Surface Mining Reclamation and Enforcement

30 CFR Parts 700, 701, 773, 774, 777, 779, 780, 783, 784, 785, 800, 816, 817, 824, and 827

[Docket ID: OSM–2010–0018; S1D1S SS08011000 SX064A000 178S180110; S2D2S SS08011000 SX064A000 17X501520]

RIN 1029–AC63

Congressional Nullification of the Stream Protection Rule Under the Congressional Review Act

AGENCY: Office of Surface Mining Reclamation and Enforcement, Interior.

ACTION: Final rule; CRA Revocation.

SUMMARY: By operation of the Congressional Review Act, the Stream Protection Rule shall be treated as if it had never taken effect. The Office of Surface Mining Reclamation and Enforcement issues this document to effect the removal of any amendments, deletions or other modifications made by the nullified rule, and the reversion to the text of the regulations in effect immediately prior to the effective date of the Stream Protection Rule.

DATES: This rule is effective on November 17, 2017. The incorporation by reference of material listed in the rule was previously approved by the Director of the Federal Register.

ADDRESSES: Previous documents related to the Stream Protection Rule, published at 81 FR 93066 (Dec. 20, 2016), are available at *www.regulations.gov* in Docket No. OSM–2010–0018.

FOR FURTHER INFORMATION CONTACT: Kathleen Vello, Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, 1849 C Street NW., Mail Stop 4550, MIB, Washington, DC 20240 Telephone: 202–208–1908.

SUPPLEMENTARY INFORMATION: The Office of Surface Mining Reclamation and Enforcement published the Stream Protection Rule on December 20, 2016 (81 FR 93066). The rule became effective on January 19, 2017. On February 1, 2017, the United States House of Representatives passed a joint resolution of disapproval (H.J. Res. 38) of the Stream Protection Rule in accordance with the Congressional Review Act, 5 U.S.C. 801 *et seq.* The Senate passed the joint resolution of disapproval on February 2, 2017 (Cong. Rec. p. S611). President Trump then signed the resolution into law as Public Law 115–5 on February 16, 2017. Under the terms of the Congressional Review Act, the Office of Surface Mining Reclamation and Enforcement's Stream Protection Rule must be ''treated as though such rule had never taken effect.'' 5 U.S.C. 801(f).

However, because the Congressional Review Act does not include direction regarding the removal, by the Office of the Federal Register or otherwise, of the voided language from the Code of Federal Regulations, the Office of Surface Mining Reclamation and Enforcement must publish this document to effect the removal of the voided text. This document will enable the Office of the Federal Register to effectuate congressional intent to remove the voided text of the Stream Protection Rule which is to be treated as if it had never taken effect and to restore the previous language and prior state of the Code of Federal Regulations.

This action is not an exercise of the Department's rulemaking authority under the Administrative Procedure Act because the Department is not ''formulating, amending, or repealing a rule'' under 5 U.S.C. 551(5). Rather, the Department is effectuating changes to the Code of Federal Regulations to reflect what congressional action has already accomplished—namely, the nullification of any changes purported to have been made to the Code of Federal Regulations by the Stream Protection Rule and the reversion to the regulatory text in effect immediately prior to January 19, 2017, the effective date of the Stream Protection Rule. Accordingly, the Department is not soliciting comments on this action. Moreover, this action is not a final agency action subject to judicial review.

List of Subjects

30 CFR Part 700

Administrative practice and procedure, Reporting and recordkeeping requirements, Surface mining, Underground mining.

30 CFR Part 701

Law enforcement, Surface mining, Underground mining.

30 CFR Part 773

Administrative practice and procedure, Reporting and recordkeeping requirements, Surface mining, Underground mining.

30 CFR Part 774

Reporting and recordkeeping requirements, Surface mining, Underground mining.

30 CFR Part 777

Reporting and recordkeeping requirements, Surface mining, Underground mining.

30 CFR Part 779

Environmental protection, Reporting and recordkeeping requirements, Surface mining.

30 CFR Part 780

Incorporation by reference, Reporting and recordkeeping requirements, Surface mining.

30 CFR Part 783

Environmental protection, Reporting and recordkeeping requirements, Underground mining.

30 CFR Part 784

Reporting and recordkeeping requirements, Underground mining.

30 CFR Part 785

Reporting and recordkeeping requirements, Surface mining, Underground mining.

30 CFR Part 800

Insurance, Reporting and recordkeeping requirements, Surety bonds, Surface mining, Underground mining.

30 CFR Part 816

Environmental protection, Incorporation by reference, Reporting and recordkeeping requirements, Surface mining.

30 CFR Part 817

Environmental protection, Incorporation by reference, Reporting and recordkeeping requirements, Underground mining.

30 CFR Part 824

Environmental protection, Surface mining.

30 CFR Part 827

Environmental protection, Surface mining, Underground mining.

■ For the reasons given in the preamble, and under the authority of the Congressional Review Act (5 U.S.C. 801 *et seq.*) and Public Law 115–5 (February 16, 2017), the Department of the Interior, Office of Surface Mining Reclamation and Enforcement amends parts 700, 701, 773, 774, 777, 779, 780, 783, 784, 785, 800, 816, 817, 824, and 827 of chapter VII of title 30 of the Code of Federal Regulations as follows:

■ 1. Revise part 700 to read as follows:

PART 700—GENERAL